The Electrical Industry's Weekly Magazine

May 14, 1956

Electrical World

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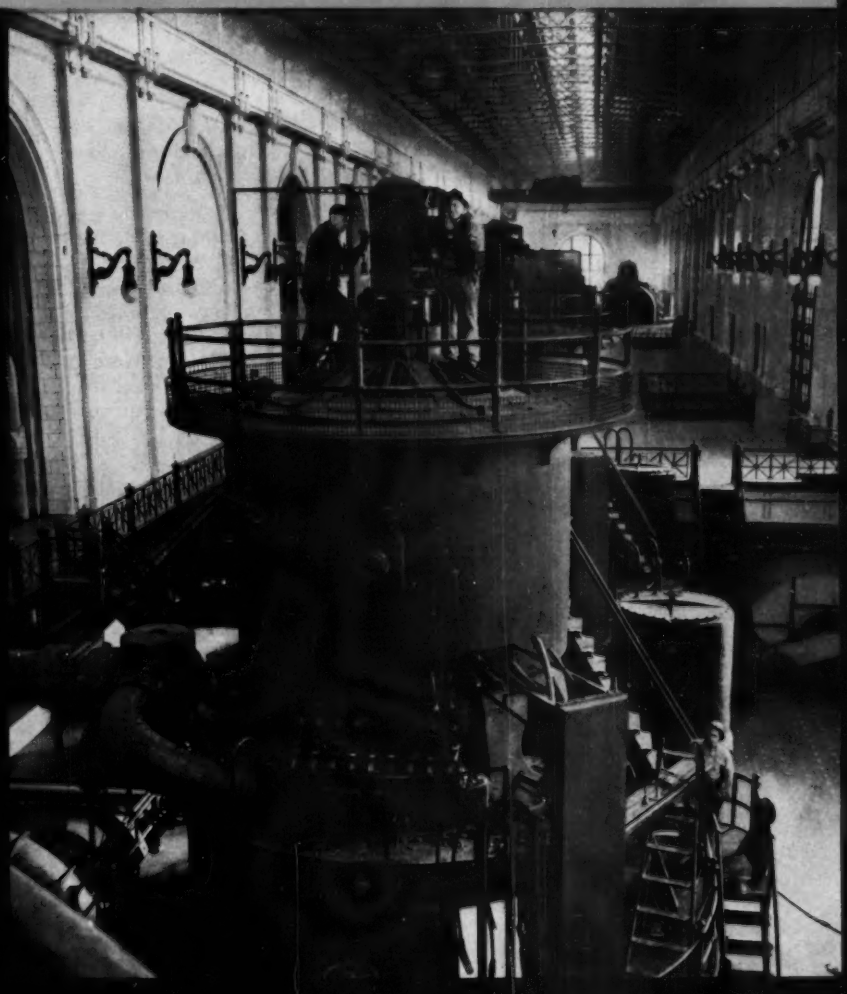

NEW UNITS FOR OLD PLANTS: When Do They Pay?

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What Does the Hoover Report on Power Offer?

. . . Page 103

Get the Regulator you can

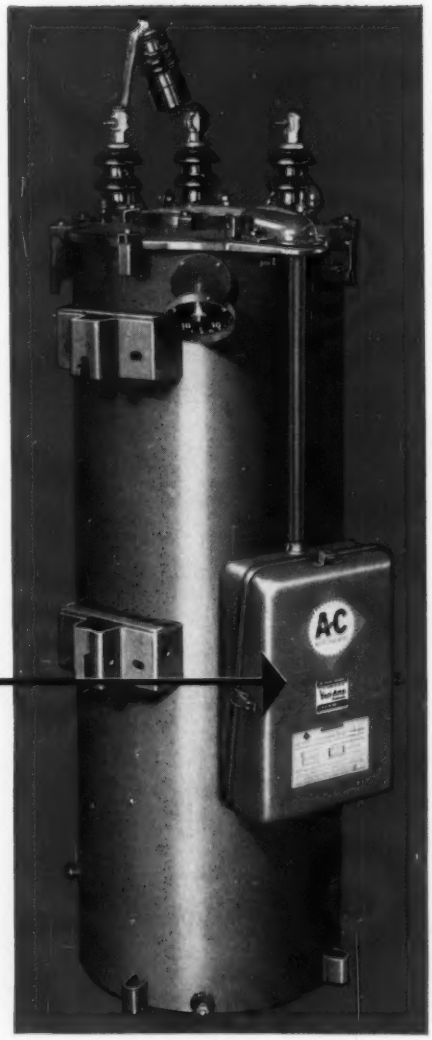
Tailor To Your System Needs

Vari-Amp feature has built-in provisions for system needs

Now you can tailor a voltage regulator to your system's exact requirements—no need to accept ±10% regulation if your system can operate more profitably at a different range. The *Vari-Amp* feature on Allis-Chalmers voltage regulators provides *five* current ratings — 25 regulating combinations.

You can even utilize unequal ranges of regulation. Here's how it might work on a distribution regulator: set a unit for 6¼% range in the raise direction, providing 135% current capacity, and for 10% in the lower direction, at 100% of current capacity.

In addition to providing for many variations to suit many different systems, the *Vari-Amp* feature gives you more for your regulation dollar by permitting increasing capacity in five steps. On a distribution regulator, for example, you can get 160% of current capacity by reducing the range of regulation to ±5%.



25 REGULATING COMBINATIONS

This regulator equipped with

Vari-Amp Feature

ALLIS-CHALMERS

Get the complete story on the unusual opportunity for matching a regulator to your needs and getting extra capacity with the *Vari-Amp* feature. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

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Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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for DOUBLE SHEATH PROTECTION use Okolite-Okoprene control cables

The W. B. Tuttle Plant of the City Public Service Board, San Antonio, Texas.

A modern plant—in appearance and engineering—the W. B. Tuttle Plant of the City Public Service Board of San Antonio, Texas is the city's newest installation. Okolite-Okoprene control cables are used throughout the plant to control the 66,000kw output.

Okolite-Okoprene multi-conductor control cables give *double* protection. First, each conductor is given complete terminal-to-terminal protection by its own Okoprene sheath. Second, additional protection is provided by an Okoprene sheath over the entire cable assembly.

Okoprene is highly resistant to moisture, acids, alkalies, and heat. It is nonflammable and will not be corona-cut if ozone is developed by adjacent equipment. Thus, each conductor in Okolite-Okoprene multi-conductor control cables is protected twice against these dangers. This double sheath protection guarantees long cable life and reliable, round-the-clock circuit security.

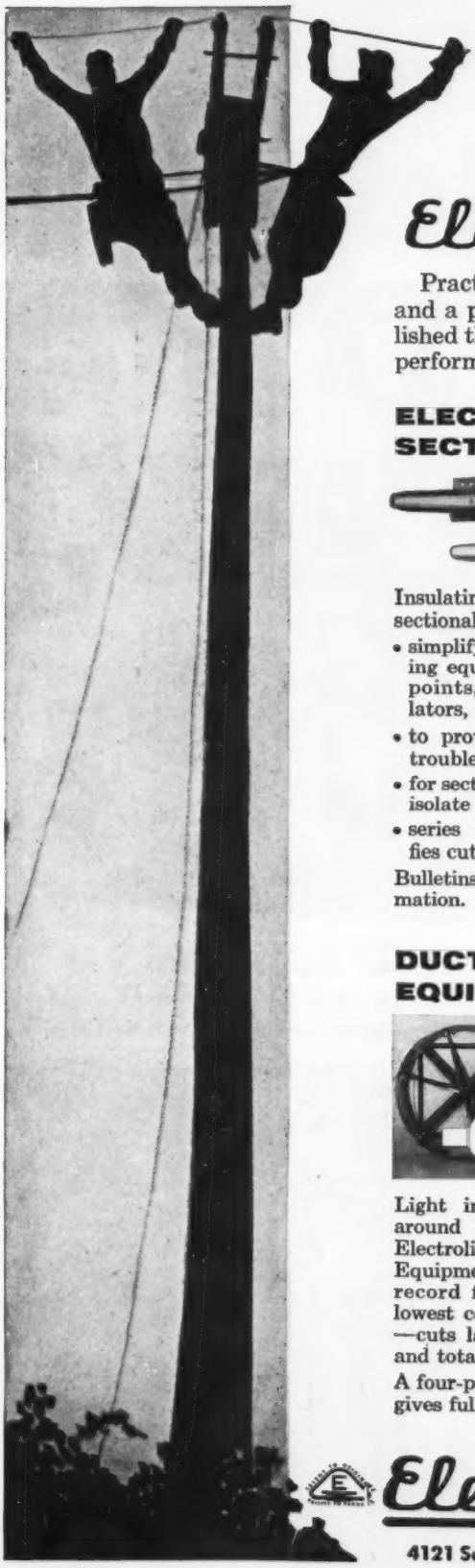
For complete details on Okolite-Okoprene control cables, write for Okonite's Bulletin EW-1056-A. The Okonite Company, Passaic, New Jersey.

A multi-conductor, color-coded Okolite-Okoprene control cable.

Available with either copper or aluminum conductors

OKONITE OKONITE SINCE 1878 ***insulated cables***

2709

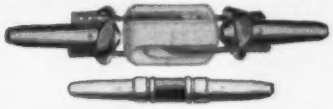


for the largest number of line applications, at the lowest possible cost . . .

Electroline Products

Practical experience designed these Electroline Products; and a practical habit of keeping close tab on costs has established them as first in the field—for top quality and economical performance.

ELECTROLINE SECTIONALIZERS

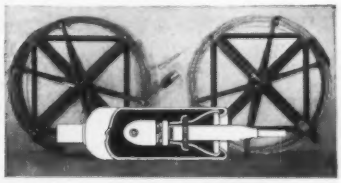


Insulating automatic line splice sectionalizers:

- simplify cutting-in of regulating equipment—disconnecting points, fuses, voltage regulators, series capacitors, etc.
- to provide points to test for trouble
- for sectionalizing networks—to isolate and test area in trouble
- series street lighting—simplifies cutting-in series lamps

Bulletins contain complete information.

DUCT-RODDING EQUIPMENT



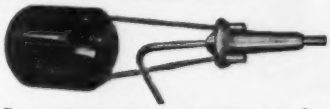
Light in weight, feeds easily around bends, easy to handle. Electroline Steel Duct-Rodding Equipment has an extraordinary record for high efficiency at lowest cost. A big money-saver—cuts labor cost, original cost and total investment.

A four-page illustrated brochure gives full information.

AUTOMATIC LINE SPLICES

It is well said of these simple, rugged units—"They go on in no time; they hang on for all time." Easy to install—and their mechanical strength exceeds the rated breaking strength of the conductors. Ideal for restoring service.

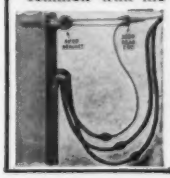
AUTOMATIC DEAD-ENDS



In a typical "torture" test for strength, gripping and vibration damping features, 100,125,000 recorded vibrations did not develop any sign of failure of conductor in these rugged dependable Dead-Ends. Engineers call it equivalent to 50 years of ordinary service.

Electroline Service-Drop Automatic Dead End. The "3800" Series for holding pre-assembled service cable using a bare neutral conductor as the messenger.

The method of gripping the bare neutral employed by this ELECTROLINE Anchorage eliminates the danger of short circuiting the phase wires so common with the use of concentric cable clamps.



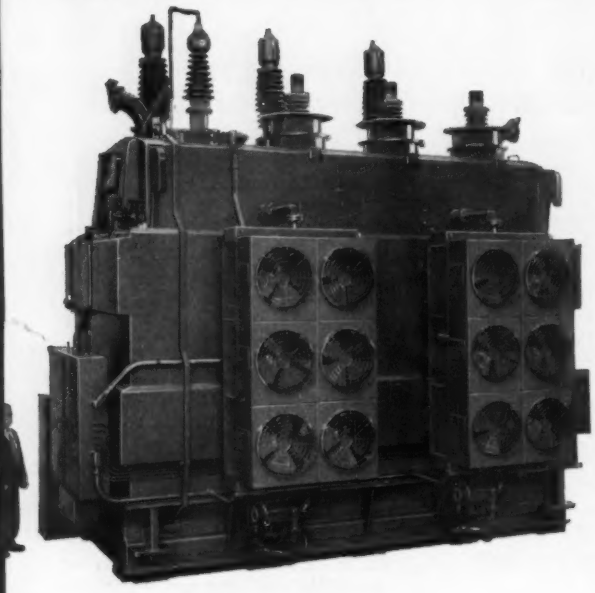
ELECTROLINE Service-Drop Anchor Bracket. The "4000" Series for securely supporting the cable at any angle.

Electroline Company

4121 So. LaSalle St., Chicago 9, Ill. In Canada: POWERLITE DEVICES, LTD., TORONTO

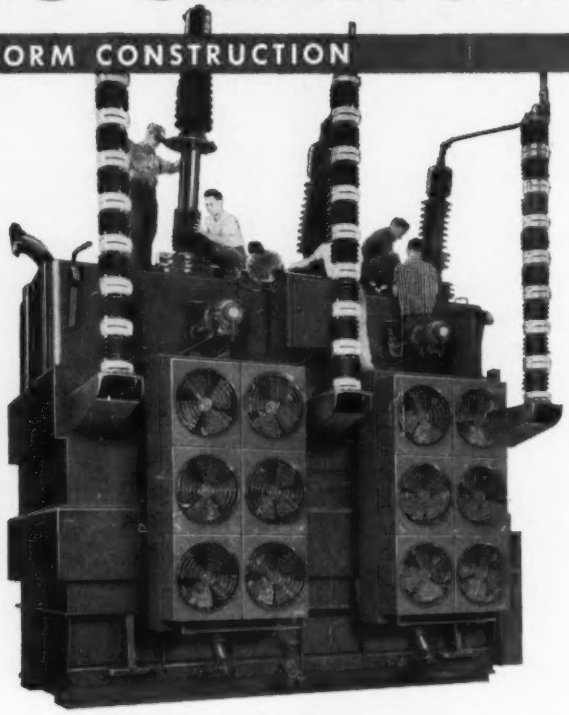
MAIN STEP-UP
GENERATING STATION

CONTOUR-DESIGN, SHELL-FORM CONSTRUCTION



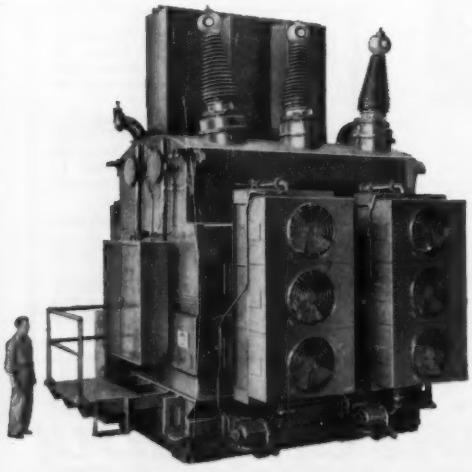
175,000 Kva 3 PHASE

High Voltage: 115,500 Grd. Y volts
Low Voltage: 17,500 Delta volts
Oil-immersed, forced-oil-cooled with forced-air cooler



140,000 Kva 3 PHASE

High Voltage: 115,000 Grd. Y volts
Low Voltage: 14,700 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air-cooler



120,000 Kva 3 PHASE

High Voltage: 145,000 Grd. Y volts
Low Voltage: 19,800 Delta Volts
Oil-immersed, forced-oil-cooled with forced-air cooler

CORE-FORM CONSTRUCTION

56,000/70,000 Kva SINGLE PHASE

High Voltage: 93,000/161,000 Grd. Y volts
Low Voltage: 19,000 volts
Oil-immersed, self-cooled/forced-air-cooled

TRANSFORMERS

BY

PENNSYLVANIA

. . . pioneer of 1-piece shipment of large power transformers

The three main step-up transformers pictured at the left are "giants" from the standpoint of kva capacity — ranging from 120,000 kva to 175,000 kva. In physical size, however, their dimensions and weights were kept well within the limits for *one-piece shipment.* This was possible because of the extreme compactness of Pennsylvania's own "contour design" shell-form construction.

The units traveled to their respective installation sites in an upright position, with only bushings, cooling equipment and certain accessories removed. This meant easier handling in the field, with greatly reduced installation time and costs.

Station Auxiliary TRANSFORMERS

2,000 Kva SILICONE-INSULATED DRY-TYPE TRANSFORMER

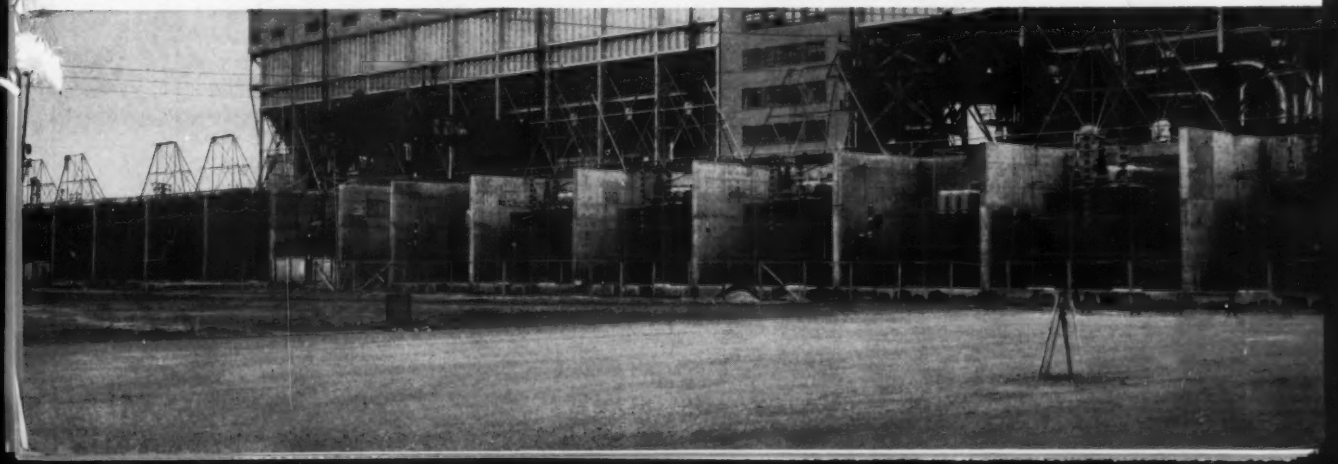
Just as Pennsylvania led the way in one-piece shipment of large power transformers, the company also pioneered the development of silicone-insulated units —the fire- and explosion-resistant transformers that are safest of all for both indoor and outdoor installations.

The 2000 kva station auxiliary unit pictured is believed to be the largest silicone-insulated (formerly "Class H") transformer ever built. It is a group 3, sealed-in nitrogen, dry-type unit; three phase, 60 cycles, 150°C. temperature rise; 2400Δ—480Δ volts.

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** Greater Pittsburgh District

As the *pioneer* of one-piece shipment of large power transformers, Pennsylvania has long been offering this time-saving, cost-cutting advantage with *core-form* transformers as well as with contour-design (shell-form) units. For example, the nineteen 56,000/70,000 kva main step-up generating station transformers pictured here were shipped to their destination in an upright position, completely assembled except for bushings and detachable radiators.



Another **POWER MODERNIZATION AWARD** featuring **RILEY Steam Generating Equipment.**

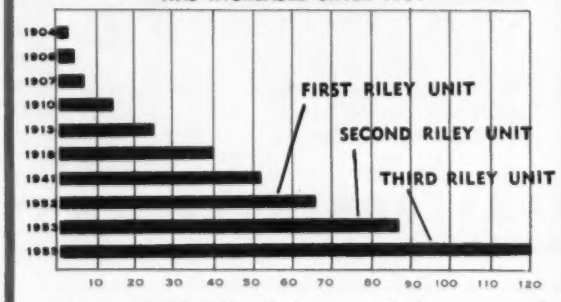
Iowa-Illinois Gas & Electric Company employs sound dollar-saving planning in modernizing its MOLINE STATION

retires ten old boilers - puts three RILEY

Results

1. Increased plant capabilities from 53,000 kw to 119,000 kw.
2. Reduced heat rate 24%.
3. Cut kilowatt production cost by 2 mills.
4. Lowered plant per kilowatt investment from $131 to $113.

HOW GENERATING CAPABILITY OF MOLINE STATION HAS INCREASED SINCE 1904



Generating capability shown in megawatts. No figures are available prior to 1904.

SEVEN RILEY UNITS HAVE BEEN PURCHASED BY IOWA-ILLINOIS GAS & ELECTRIC COMPANY SINCE 1942

Riverside Station, Davenport, Iowa
1942—One 250,000 lbs/hr Unit—975 psi, 825 F
1946—Two 250,000 lbs/hr Units—1000 psi, 900 F

Coralville Plant, Iowa City, Iowa
1948—One 60,000 lbs/hr Unit— 500 psi, 730 F

Moline Station, Moline Iowa
1950—One 200,000 lbs/hr Unit—925 psi, 825 F
One 200,000 lbs/hr Unit—825 psi, 900 F
1952—One 250,000 lbs/hr Unit—975 psi, 905 F

Total Steam Generating Capacity — 1,460,000 pounds per hour

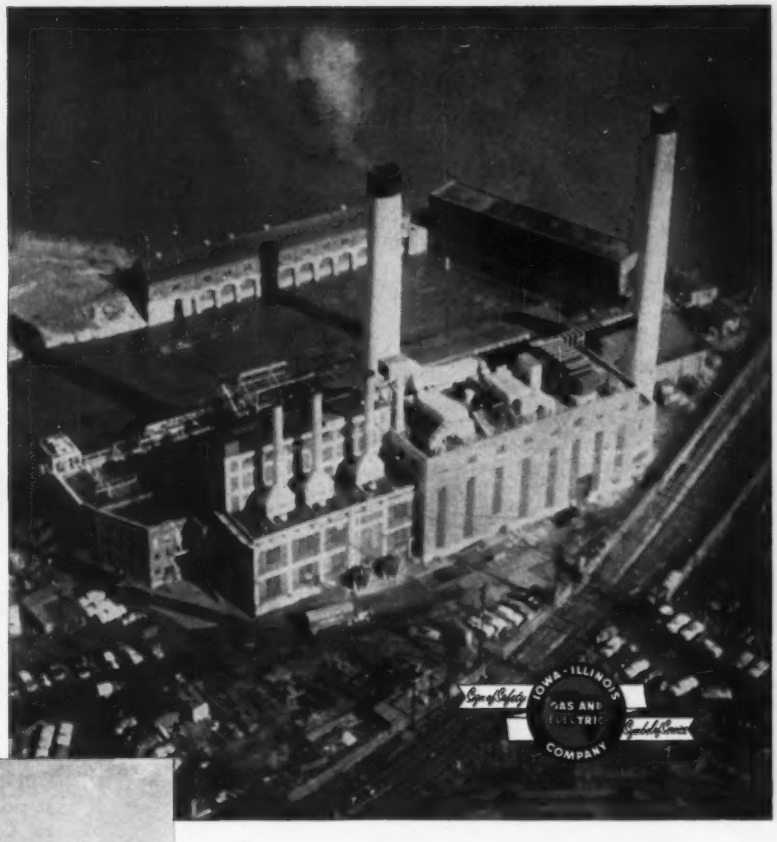
As a result of a carefully planned two-stage modernization program, Iowa-Illinois Gas & Electric Company's Moline Station now is a modern 119,000 kw generating plant with high operating efficiency. Three Riley Steam Generating Units installed since 1951 have replaced ten old boilers originally installed in 1906. Teaming up with six retained units of the original plant the new Riley units are credited with substantially cutting kilowatt production costs, lowering heat rate and actually reducing the per kilowatt ratio of plant investment.

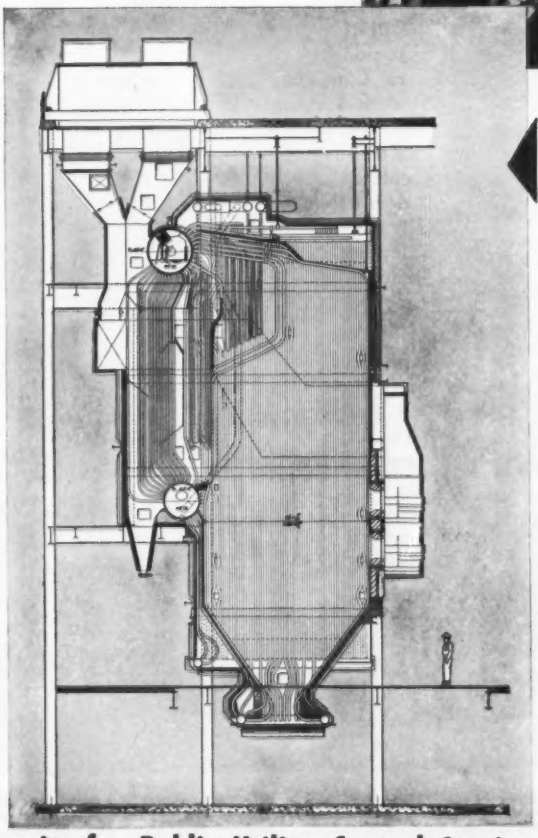
A further result of this outstanding modernization program was the winning of POWER Magazine's Modernization Award in 1954 — a tribute to the sound and realistic economic planning and engineering on the part of Iowa-Illinois Gas and Electric Company and its consulting engineers, Sargent & Lundy.

Moline Station serves the quad-cities of Moline, Rock Island, East Moline, Illinois, and Davenport, Iowa, and supplements the 140,000 kilowatts of the Riverside Station located at Davenport. Riverside Station has three pulverized coal fired Riley units each with a steam generating capacity of 250,000 pounds per hour.

RILEY designs, engineers, manufactures and erects complete steam generating

units on the line





THE third Riley unit installed at Moline Station operates at 250,000 lbs/hr at an efficiency of 88.4% with steam temperature at 905 F and pressure at 825 pounds. Six Riley horizontal flare type forced draft burners are installed for firing oil, natural gas and future coal. The increase in steam temperature from 825 F to 905 F decreased heat rate 2.6%.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY

Stoker Corporation

WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Washington, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver, Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

units for Public Utility Central Stations and Industrial Power and Heating Plants

Circle rolls its own copper rod at Hicksville. Later this rod is shipped to the Maspeth plant for wire drawing to all sizes. Circle also sells hot rolled copper rod to other industrial users.

In addition to single conductor wire, Circle also produces stranded wire and cable. This high speed machine can assemble 12 wires to form concentrically stranded cable.

All of Circle's products are made to rigid quality standards. Here, rubber-insulated wire is tested in water under an electric charge. Any defect is immediately recorded.

The "house" that pleased customers took

35 years to build

WAY BACK IN 1920 – many of our old friends will remember – Circle started business in a small shop turning out armored cable.

That was over 35 years ago. Since then, thanks to the support and growth of the electrical industry – plus a policy we early adopted of providing top-quality products with fast, friendly service – Circle has grown to be one of the country's largest producers of building wire and cable.

Today, Circle plants contain close to a million square feet of space devoted exclusively to the manufacture of wire and cable of the highest possible quality for residential, commercial and industrial use.

It takes pleased, loyal customers in ever increasing numbers to make such growth possible. If the future means still greater growth for Circle, it will be because one thing remains constant: the determination to continue to provide unsurpassed quality of product plus the swift, out-of-the-ordinary, personalized service which has made thousands of friends for Circle from coast to coast.

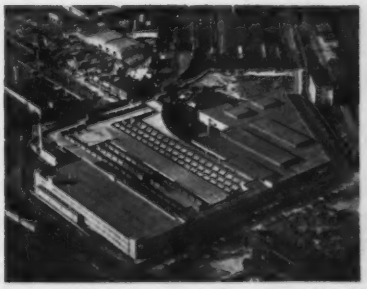
Circle Wire & Cable Corp., 5500 Maspeth Avenue, Long Island, New York.

C W C **CIRCLE** **WIRE & CABLE**

a subsidiary of
Cerro de Pasco Corporation

PLANTS: Maspeth and Hicksville, N.Y. **SALES OFFICES & WAREHOUSES:** Atlanta, Baltimore, Boston, Chicago, Cincinnati, Dallas, Des Moines, Detroit, Houston, Jacksonville, Los Angeles, Miami, Minneapolis, Nashville, New Orleans, Omaha, Philadelphia, Pittsburgh, Portland, Ore., San Francisco, Seattle, St. Louis. **ADDITIONAL SALES OFFICES:** Cleveland, Davenport, Ia., Newark, New Haven, New York, Utica.

RUBBER COVERED WIRES & CABLES – VARNISHED CAMBRIC CABLES – PLASTIC INSULATED CABLES – NEOPRENE SHEATHED CABLES

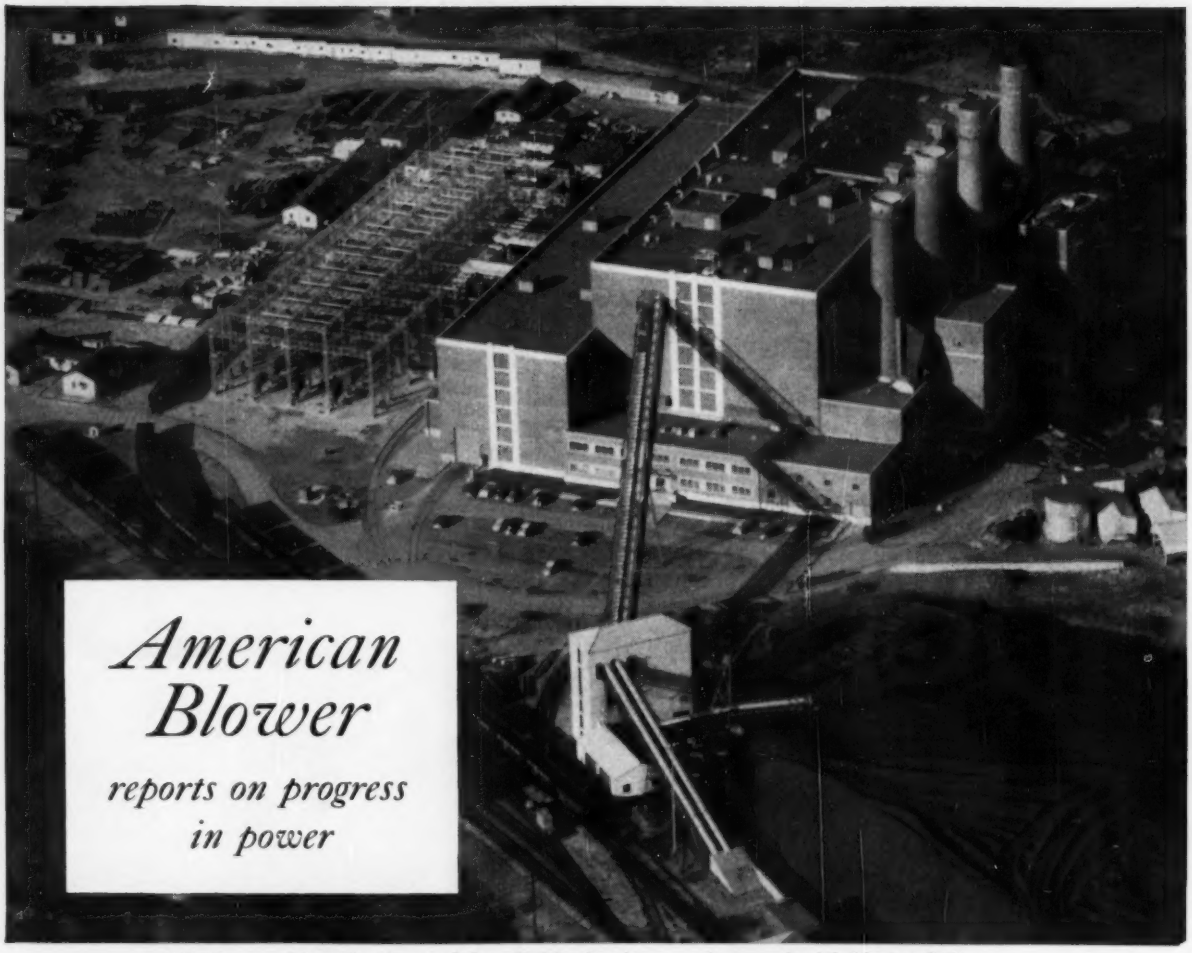


A panoramic view of Circle's huge plant at Maspeth, Long Island. Here, on 13 acres of space, Circle daily turns out millions of feet of top-quality wire and cable.

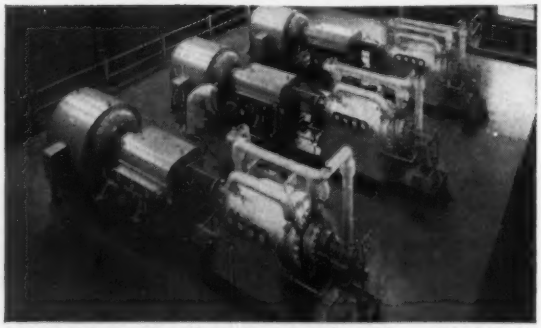
Circle's modern rod mill and steel flattening plant on Long Island, one of the country's largest single units, has a rolling capacity of over 150 million lbs. of copper per year.

Perhaps, the biggest single reason for Circle's growth has been its fast, friendly service to customers. Circle maintains a national network of 22 warehouses to support this policy.

Potomac Electric Power



The Potomac River Plant is one of three PEPCo electric-power giants serving Washington, D.C., and nearby areas of Maryland and Virginia.



At PEPCo's Benning Plant, three American Blower Gyrol Fluid Drives provide adjustable-speed control for boiler-feed pumps. Each is rated at 1250 hp at 3600 rpm. Six Gyrol Fluid Drives for the same application are installed at the Potomac River Plant — each is rated at 1750 hp at 3600 rpm.

American Blower Forced Draft Fans are also installed at the Potomac River Station. Fans on Boilers 1 and 2 are rated at 113,000 cfm @ 100°F @ 11.0" sp @ 1150 rpm. Fans on Boilers 3 and 4 are rated at 111,000 cfm @ 100°F @ 17.5" sp @ 700 rpm.

records all-time peak load:

810,000 kw

Potomac Electric Power Company's new high peak load of 810,000 kw in 1955 marked a 9.3% increase above the peak of the previous year. Although it was appreciable, the boost is only the beginning.

The coming years will see the continuation of an expansion program in which Potomac Electric Power Company has been engaged since the close of World War II . . . to better serve its more than 320,000 customers in the District of Columbia, and areas of Maryland and Virginia. During the 14-year period, 1947 to 1960, additions to PEPCo's electric plant are expected to total $320 million.

As an important part of its power build-up, PEPCo relies on American Blower Mechanical Draft Fans for efficient air handling and Gyrol Fluid Drives for smooth power transmission.

Like PEPCo, many other progressive utilities depend on American Blower equipment to meet rigid power-plant demands. Perhaps we can serve *you*, too. Call our nearby branch office for full data on our Mechanical Draft Equipment, Fly Ash Precipitators, Heavy Duty Steam Coils, and Gyrol Fluid Drives for boiler-feed pump and fan control.

American Blower Sirocco Induced Draft Fans service four boilers at the Potomac River station. Latest fans are rated at 160,000 cfm @ 250°F @ 18.0" sp. @ 667 rpm.

AMERICAN BLOWER CORPORATION, DETROIT 32, MICHIGAN • CANADIAN SIROCCO COMPANY, LTD., WINDSOR, ONTARIO

Division of AMERICAN-Standard

AMERICAN 75th ANNIVERSARY YEAR **BLOWER**

Standard®

Transformer's DESIGN FEATURES HELP CUT COSTS

● Standard Transformer's attention to transformer components helps cut maintenance costs and boosts transformer life, yet you pay no more for Standard equipment.

Insulation exceeds all ASA specifications and gives increased protection against flashover. Coils are moisture-proof.

Power-sheared laminations minimize short circuits and core loss caused by burrs. Simple construction eliminates expensive and unnecessary clamps and parts in core assemblies. Greater coil surfaces practically double radiated heat.

NEMA size connectors, strain tested by mercurous nitrate, are used on all bushings. Installation and maintenance time and costs are reduced.

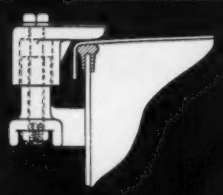
Standard engineers will incorporate components of your choosing in your transformers and work with you to design the transformers best suited to your needs.

WRITE for your new Standard Single-Phase Transformer Bulletin S-401-B. It's ready now!

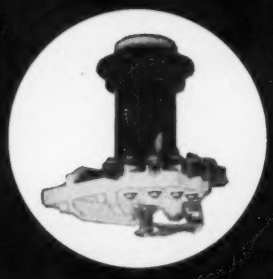
Standard®

THE STANDARD TRANSFORMER COMPANY

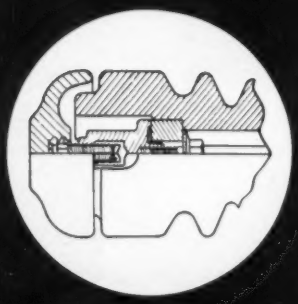
WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES



UNIFORM SEAL—This Standard design feature creates a four-point contact that assures a positive seal completely around the transformer cover. A Neoprene gasket seals out all dust and moisture.



TAP CHANGER—Your transformers can be equipped with four taps above or below, or half above and half below, as you specify. The switch embodies a contact-making assembly with a spring-loaded brass wheel for positive contact. Normal settings are with a four-tap voltage section. 2½% taps within 10% range of normal rating.



TANK WALL BUSHING—Permits line insertion without tools. No exposed live parts. Terminal compression stud keeps insulated plastic cap from falling off when unscrewed to receive primary leads. Cables enter from either side. Pressure from clamping shoe holds lead securely.

There's more in this barrel for you...

James E. Pratt, left, Socony Mobil engineer, obtains performance data on hydraulic system at an aluminum extrusion plant.

MORE ENGINEERS

to help you improve production and cut costs!

Specify Socony Mobil and get the services of more industrial lubrication engineers than are provided by any other oil company.

These specialists, working closely with your Mobil representative, will help you set up a plant-wide program of correct lubrication . . . advise on any lubrication problems that might arise. Their long experience and expert recommendations can improve your production and cut costs.

Socony Mobil products are also backed by *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* approvals from machine builders . . . *more* continuous research to assure continually improved products . . . *more* practical experience—90 years!

Always specify Socony Mobil. There's *more* in every barrel for you!

SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS

NETWORK
TRANSFORMERS
higher kva in same vault space

BALANCED THERMAL DESIGN

for increased life, reduced size and increased loading of network systems

General Electric transformers feature balanced thermal design (BTD), giving reduced hottest-spot temperature rises throughout the transformer core-and-coil structure. Users get these benefits . . .

INCREASED LIFE

Transformer life, in accordance with ASA Guide C57.32 for loading transformers, is increased from 20 to 30 per cent, depending on load, for every 2 C reduction in hottest-spot temperature. We are careful therefore, to maintain thermal balance.

INCREASED LOADING

Since transformer life is a function of hottest-spot temperature, units having BTD are better able to carry the loads normally encountered in network service. G-E network transformers, therefore, permit maximum loading of your network system without reducing transformer life.

REDUCED SIZE

With BTD, transformer designers can make the most efficient use of materials. G-E BTD units are as much as 17 per cent smaller than comparable units without BTD—you can put additional transformer kva in the same vault space saving on construction costs.

HOW BTD IS ACHIEVED

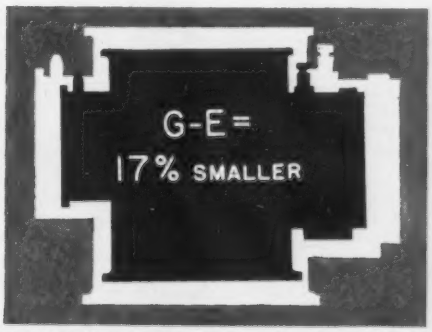
G-E engineers subject prototype coils to heat runs under carefully controlled conditions to assure thermal balance before putting the final design into production.

The engineers check temperature distribution by means of thermocouples, as shown in photo. Automatic equipment controls load and maintains accurate temperature records throughout tests. Even test room humidity, temperature and drafts are closely controlled to assure accurate tests.

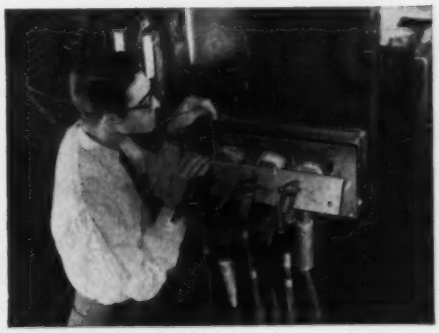
While featuring BTD, G-E network transformers are also designed to withstand overvoltage conditions and short-circuit stresses, thus giving over-all design balance—there are more than 10,000 G-E network transformers now in service.

HELP FOR YOU

For help in solving your network problems, contact your nearest G-E Apparatus Sales Office. General Electric Company, Schenectady, N. Y. 435-7



REDUCED SIZE With BTD, engineers make the most efficient use of materials—G-E units are up to 17% smaller than units without BTD.



INCREASED LIFE Before beginning production, we check designs for thermal balance, even checking contact that joins with network protector.

Progress Is Our Most Important Product

GENERAL ELECTRIC

S&C Positect

gives

1 HIGHEST INTERRUPTING CAPACITY
2 FULL LOAD SWITCHING
3 SAFETY

These are the reasons so many large utilities—after exhaustive testing—have "standardized" on the Positect.

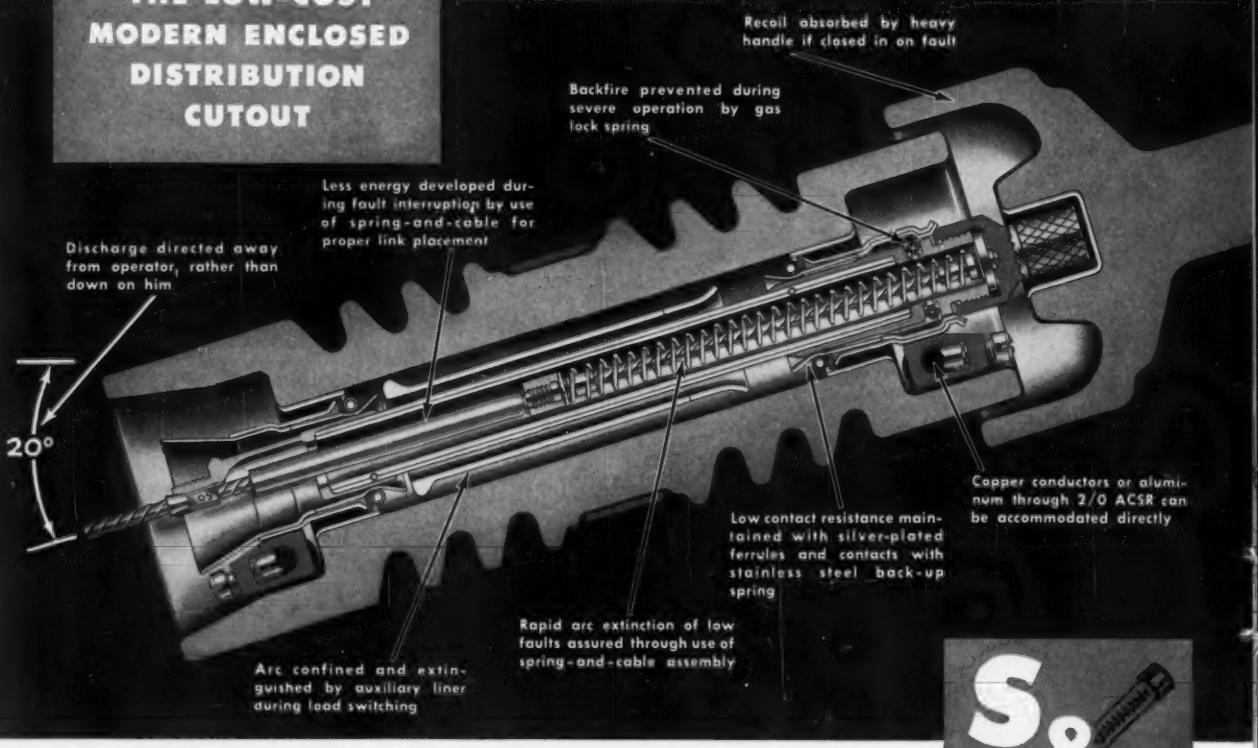
The high interrupting capacities—10,000 and 12,000 amperes assymetrical for the 50 and 100 ampere sizes, respectively—are backed up by 14,000 and 16,000 ampere one-shot ratings, matching the high faults on today's distribution feeders.

Full load switching—200 amperes of load current, and associated magnetizing and charging current—is positive and without external arcing. And—best of all—there's built-in safety for the operator. Hook stick operation is unnecessary.

For details on the many advantages of "standardizing" on the Positect, write for Catalog Sec. 520 . . . we will gladly send one.

Load switching is accomplished by removal and insertion of bayonet.

THE LOW-COST MODERN ENCLOSED DISTRIBUTION CUTOUT


Recoil absorbed by heavy handle if closed in on fault
Backfire prevented during severe operation by gas lock spring
Less energy developed during fault interruption by use of spring-and-cable for proper link placement
Discharge directed away from operator, rather than down on him
20°
Copper conductors or aluminum through 2/0 ACSR can be accommodated directly
Low contact resistance maintained with silver-plated ferrules and contacts with stainless steel back-up spring
Rapid arc extinction of low faults assured through use of spring-and-cable assembly
Arc confined and extinguished by auxiliary liner during load switching

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
MAY 14, 1956

Power generation for 1956 will be 607,255,000,000 kwhr, according to estimates of the 438 participants of the Power Generation Pool. This average prediction is approximately 11% above actual generation of 547-billion kwhr for 1955. The average of the estimates of the 53 utility presidents and board chairmen in the pool showed an expected load growth of about 12%. P.S.—EW forecasted 588-billion kwhr for 1956 last September. This estimate is now being raised to around 602-billion kwhr.

• • •

Watch the copper companies. Cerro de Pasco is negotiating purchase of Fairmont Aluminum Co, a $9-million aluminum sheet strip and coil-rolling mill in Fairmont, W. Va. And late last year, Cerro bought Circle Wire & Cable. Question—Fairmont plus Circle equals more aluminum conductor?

But it takes at least two to make a trend. Anaconda is deep in aluminum, primary and fabricating. And Kennecott owns part of Kaiser Aluminum.

More good news for aluminum. The House passed and sent to the Senate a bill to continue for another two years, until July 1958, the duty-free importation of crude and calcined bauxite.

The cost spread between aluminum and copper decreases as world copper prices continue to drop below the U. S. producer quotation of 46¢. But, big domestic producers, now taking orders for June delivery, report buying as satisfactory. Meanwhile, nearly all the big copper mining companies are starting labor negotiations on contracts expiring June 30.

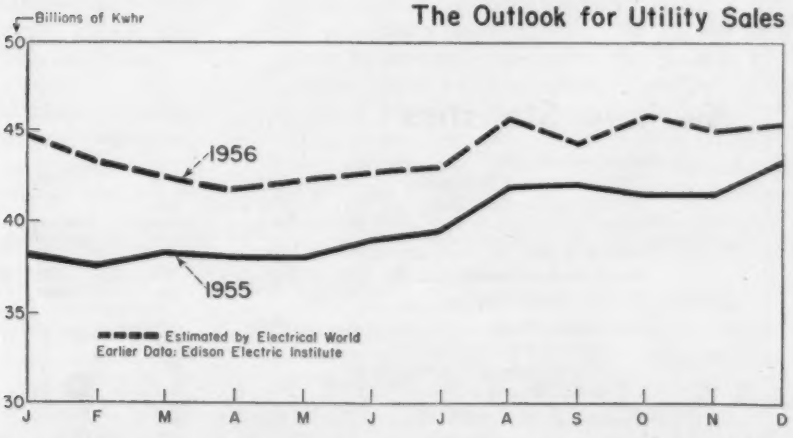
• • •

Electrical equipment prices will reflect a steel price hike. If steel wages go up 18¢ on July 1 to avoid a strike when present contract expires, steel prices will have to be raised $10 to $12 a ton. Electrical equipment manufacturers revealed that each apparatus line would be analyzed separately and then appropriate price boosts will be put into effect.

• • •

Discounts on residential rates may be the key to higher annual load factor. Edwin Vennard of Edison Electric Institute suggests cost of serving air conditioning in areas having air-conditioning load factors of 15 to 20% annually could be covered by 2½¢ per kwhr for 1,500 kwhr per kw per year. After that the customer would pay 1½¢ per kwhr—a 40% discount.

The Outlook for Utility Sales



STATISTICS

Electric Living Takes Only a Small Part of Consumer Income

(Billions of Dollars)

	Consumer Disposable Income	Expenditures For Automobiles: Autos and Parts	Gasoline and Oil	Total	% of Disp. Income	Expenditures For Energy: Residential	% of Disp. Income
1946	159.2	3.9	3.0	6.9	4.3	1.2	0.75
1947	169.0	6.3	3.6	9.9	5.9	1.4	0.82
1948	187.6	7.3	4.3	11.6	6.2	1.5	0.79
1949	188.2	9.5	4.7	14.2	7.5	1.7	0.90
1950	206.1	12.4	5.0	17.4	8.4	1.9	0.92
1951	226.1	10.9	5.5	16.4	7.3	2.2	0.97
1952	236.7	10.4	6.0	16.4	6.9	2.4	1.01
1953	250.4	13.2	6.6	19.8	7.9	2.7	1.05
1954	254.8	12.5	7.2	19.7	7.7	2.9	1.13
1955	269.2	16.9	7.7	24.6	9.1	3.2	1.18

Source: U. S. Department of Commerce

Power Statistics . . .

		Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	Feb.	115.59	114.55	103.74	11.4
Peak—Class I Systems (million kw)	Jan.	95.8	98.2	84.1	13.9
Estimated Dec. '56 Peak (million kw)	Jan.	105.45	105.27	102.56	2.8
Production—billion kwhr	Feb.	47.99	51.12	40.23	19.3
Hydro		10.63	9.36	8.57	24.0
Fuel		37.36	41.76	31.66	18.0
Sales—billion kwhr	Jan.	46.32	45.19	39.47	17.4
Residential		13.41	12.25	11.76	14.0
Commercial		7.00	6.81	6.24	12.2
Industrial		23.57	23.75	19.31	22.1
Other		2.34	2.39	2.15	8.8
Fuel Consumption	Feb.				
Coal—million tons		13.44	15.22	11.09	21.2
Oil—million barrels		7.10	8.22	7.43	−4.4
Gas—billion cu ft		67.81	68.27	63.63	6.6
Net Income Class A & B Co's—$ million	Jan.	127.26	125.72	112.21	13.4
Residential Customers—millions	12 mos.	44.51	44.41	43.24	2.9
Revenue per kwhr	ended	2.64¢	2.65¢	2.69¢	−1.9
Avg kwhr per customer	Jan. 31	2,778	2,751	2,564	8.3
Avg annual bill		$73.34	$72.63	$68.97	6.3

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	Mar.	145	144	138	5.1
ENR Construction Cost	April	143.2	142.8	135.7	5.5
BLS Cost-of-living	Feb.	114.6	114.6	114.3	0.3
NEMA Sales	Feb.				
Insulation materials		163	159	137	19.0
Electric appliances		109	105	107	1.9
Wholesale prices	Feb.				
Motors and generators		126.6	126.5	121.0	4.6
Transformers and regulators		131.2	131.2	127.8	2.7
Switchgear and fuses		147.5	147.5	135.4	8.9
GNP—annual rate—$ billion	4th Qtr.	397.3	392.0	367.1	8.2

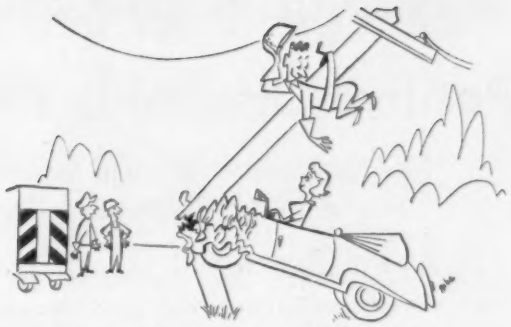
Your Business

Skeet shooters and bird hunters should like Remington's new Sportsman-58 12-gauge, three-shot, gas-operated autoloader shotgun. It is well balanced, sleek-looking, and at 7 lb makes for the fastest kind of handling. At the same time, it is kind to the shoulder.

The mild recoil comes from a unique feature, a "dial-a-matic" load control which is designed to insure minimum recoil with all standard length shells, regular or magnum. A slight twist of the dial makes the proper adjustment and letters reveal at a glance just how the gun is set ("L" for light, low base loads, and "H" for heavy, high base loads).

This adjustment, says Remington, coupled with the "power-matic" action, "assures the shooter of dependable, positive action that allows him to maintain the stability of his pointing alignment while firing rapidly." The gun, available only in 12-gauge, retails for $129.95 in the ADL grade. It will not replace the popular Remington Model 11-48.

The philosopher's armchair: "Take time to work —it is the price of success. Take time to think —it is the source of power. Take time to play— it is the secret of youth. Take time to read—it is the foundation of knowledge. Take time to worship —it is the highway to reverence. Take time for friends—it is the source of happiness. Take time to love—it is the one sacrament of life. Take time to dream—it hitches the soul to the stars. Take time to laugh—it is the singing that helps with life's loads. Take time to pray—it helps to bring God near and washes the dust of earth from our eyes." Author unknown.



"Trust Crenshaw to make the best of any situation."

A recent tax ruling may signal caution in listing business trip expenses. The situation concerns one in which you are accompanied by your wife or any other relative. The expenses attributable to the wife or relative are not deductible unless it can be shown adequately that the wife's presence on the trip has a bona fide business purpose. Another approach to the ruling requires that expenses incurred in some personal activity, such as sightseeing or social visiting or entertaining, while on a business trip, should be treated as nondeductible.

Your Health,

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

For no particular reason the skin can suddenly become sensitive to some substance with which it comes in contact. Tiny blebs of fluid, called vesicles, appear along with redness and swelling. The exposed parts of the body are first involved. Later the remainder of the body is affected. The "itching rash" continues as long as the skin is exposed to the offending substance.

The skin can be sensitive to almost anything. Plants such as poison ivy or oak, primrose, soaps, cosmetics, hair dyes, and paints are common offenders. Many of the contact dermatoses are caused by substances encountered at one's work. Once a sensitivity occurs it seems to lead to the development of other sensitivities. This includes the medication used for treatment.

It is not always unusual contact that causes trouble. It may be some substance which has been touched every day for years.

Skin specialists use patch tests to aid in finding the offending substance. They apply a small patch containing a special diluted mixture of the suspected substance to the skin. If it is the cause, a rash will appear under the patch after several hours. Do not try this yourself, because, improperly prepared, the test can cause a severe reaction. The test may not always be accurate—you cannot, for instance, accurately test to see if a person is sensitive to a substance before he comes in contact with it.

Treatment is kept as simple as possible. Medication is prescribed to reduce the itching and remove the irritation of the skin. Desensitization against the offending substance is not too successful. The best treatment is to avoid further contact, if this is possible, with the irritant.

Your skin is more than just a sack for your insides. It is a delicate organ which reacts violently at times to the things it contacts. You may paint, powder, and scent your way into trouble. So be gentle with your hide. It has to last as long as you do.

WASHINGTON COMMENT

Positive Offense Is Best Defense: Robinson

Washington WP president advocates "swamping opposition with progress" to combat "politically minded" who seek to undermine companies

Kinsey M. Robinson, whose Washington Water Power Co is surrounded by one of the world's largest government power systems, the Bonneville grid, has been through some rough-and-tumble years.

Always a hard, vigorous worker, he has never been afraid to step off the curb and slug it out with his opponents. He proved this again last year when he beat a PUD by better than a 2-1 margin by popular vote.

Those toughening years have shown him that a positive offense is the best way to come out on top in a political scrap.

In Washington, D. C., recently to attend the annual meeting of the National Association of Electric Companies and the Chamber of Commerce of the United States, Robinson brought with him this experience; and he shared it with some of the businessmen who have not been toughened in combat.

"Take positive action," he advised. "In this age of shifting pressures, when new alliances and partnerships are formed almost daily and when slight gains made by the opposition too often become permanent, it is indeed true that he who hesitates is lost."

Robinson takes nothing for granted. In 1953 WWP began a two-year study of the Noxon Rapids dam site, previously stated by the Army Engineers to be nonfeasible as a hydro development. It cost more than $600,000 before WWP was sure the Army Engineers were wrong, but construction was begun in 1955. By 1959 this oddly shaped, $85-million dam and power plant will start producing an ultimate 400,000 kw of electric power.

Robinson sparked formation of the four-company Pacific Northwest Power Co group not long ago, and WWP has paid out its share of $1,7500,000 expended so far on the 1.2 million-kw Mountain Sheep-Pleasant Valley damsite, a development which will channel another 300,000 kw into the WWP system and enable the firm to cut its power cost in an area where power already is inexpensive.

The key to Robinson's "positive action" formula is its lack of political motivation—or perhaps its adverse effect on the political motivations of others. For Robinson believes that private enterprise will continue to be attacked by the politically minded who use the inflexible machinery of government as a lever to undermine the progress made by private companies.

To combat this, Robinson believes private companies, particularly utilities must swamp the opposition with progress, using the weight of this effort to break the opposition's lever.

Robinson makes this comment: "Progress is not a self-made thing. Certainly the river itself . . . cannot and will not take sides in this controversy between private and political development."

TECHNICAL NOTES

Relay installations will trend toward standard practices and pre-fabricated assemblies to enable limited manpower to protect growing systems.

Soldered joints of fine wires can fail from corrosion even when rosin flux is used if the soldering iron carries traces of other flux from a previous job.

Carbon tetrachloride, long used as a cleaning fluid in electrical work, can absorb moisture from damp air to corrode surfaces it has cleaned.

Relatively large generating units are easier to justify on small systems because savings in per unit investment and operating costs are greater than on large systems.

Lead sheaths can corrode on cables when incomplete curing of concrete releases calcium hydroxide.

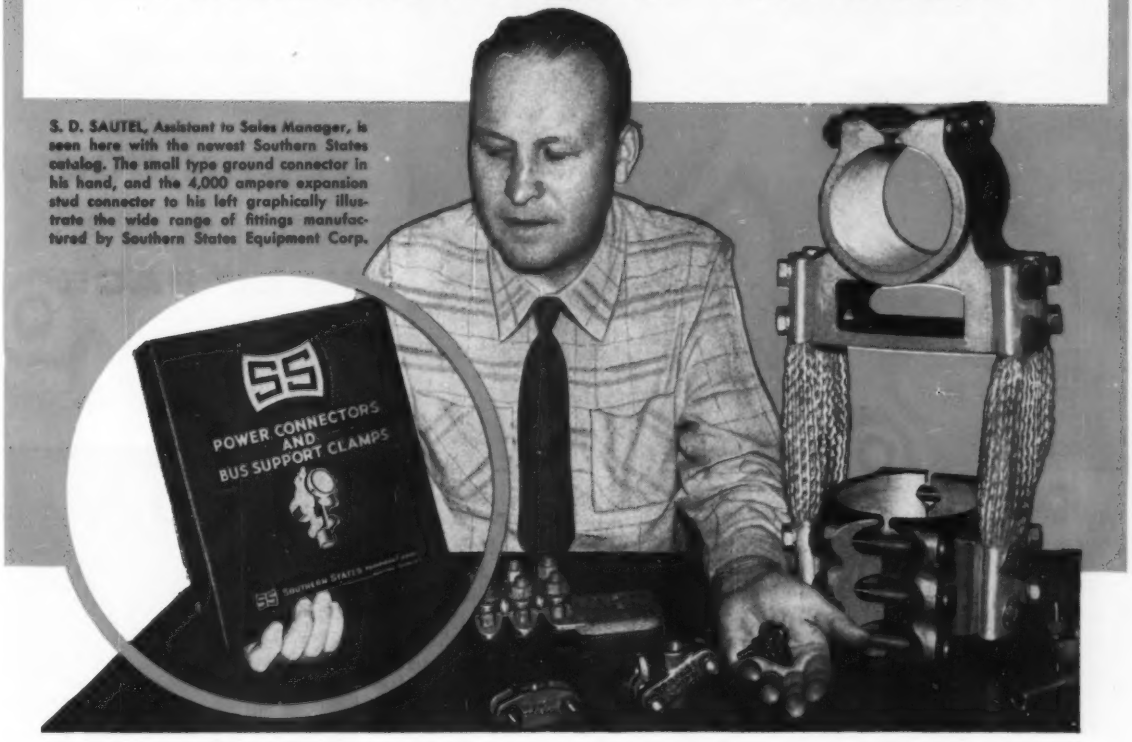
Adding Freon to nitrogen to locate cable leaks risks an accumulation of Freon in the cable insulation where it can raise pf and cause failure. Freon is difficult to purge from an underground system, and small accumulations will preclude use of a detector to find subsequent leaks.

Approximately 60,000 manhours will be required each year for primary maintenance of one 40 to 60-Mw PWR plant.

Air conditioning can start corrosion if it causes moisture to collect on susceptible metallic surfaces.

THIS CATALOG CONTAINS

THE POWER CONNECTORS AND BUS SUPPORTS NEEDED FROM GENERATION TO DISTRIBUTION



S. D. SAUTEL, Assistant to Sales Manager, is seen here with the newest Southern States catalog. The small type ground connector in his hand, and the 4,000 ampere expansion stud connector to his left graphically illustrate the wide range of fittings manufactured by Southern States Equipment Corp.

Three years ago Southern States began an extensive program of re-designing and expanding its line of power connectors and bus support clamps. Ears were strengthened and weights increased 40% to 50%.

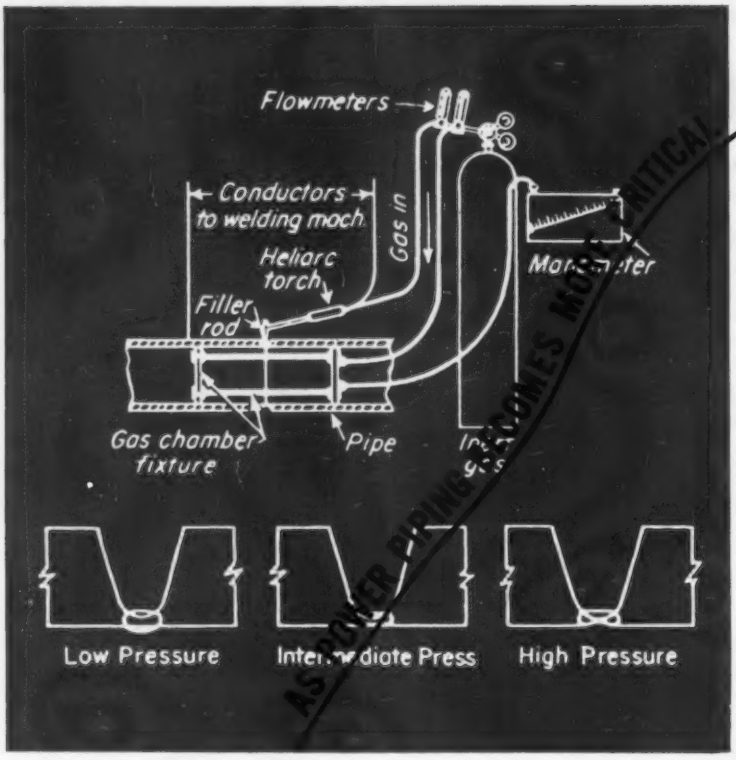
The result is a line of rugged fittings in a full range of sizes and types. You can choose a suitable Southern States connector for application on your system for practically any requirement . . . from the generating station to the distribution system.

The complete line is included in the new Southern States catalog, which is fully illustrated and indexed to make it easy to find the exact fitting required for any application.

If you have not yet received your copy and could use one, see your Southern States representative or write direct for Catalog No. 526.

SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



KELLOGG'S FIELD WELDING TECHNIQUES KEEP PACE

With main and reheat steam piping for steam-electric power plants becoming heavier and more difficult to handle because of increasing wall thicknesses, more and more of the welding previously done in fabricators' shops must be handled in the field. This, coupled with the need for still better welding techniques to combat higher operating pressures and temperatures, demands even higher standards of design and workmanship to compensate for the less favorable conditions often encountered in the field.

One way in which M. W. Kellogg sets the pace in field fabrication is with K-Weld*—Kellogg's unique inert gas shielded technique of arc welding. With K-Weld, complete penetration and a highly uniform internal contour are assured without the use of backing rings. Incorporating a Kellogg development which controls internal gas pressure and shape of the interior weld surface automatically, K-Weld is recognized as the ultimate in welding techniques for any type or size of alloy piping—both for shop and field fabrication.

A 12-page booklet, "For The Modern Central Power Station," describes K-Weld and other M. W. Kellogg facilities for the design, fabrication, installation, and testing of main and reheat steam piping.

K-Weld root bead is laid while the pipe interior is under controlled inert gas pressure in the gas chamber fixture. Diagram at top of page shows detail of this portable gas chamber fixture and how interior weld surface is controlled by varying pressure.

K-Weld is always under the supervision of a Kellogg inspector, supplementing final radiographic inspection. In addition, a permanent chart record is made on the potentiometer of all steps in welding and stress relieving.

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 711 THIRD AVENUE, NEW YORK 17, N. Y.
The Canadian Kellogg Company, Ltd., Toronto • Kellogg International Corporation, London
SUBSIDIARIES OF PULLMAN INCORPORATED

*Trademark of and patented by The M. W. Kellogg Company

POWER PIPING—THE VITAL LINK

The Finest Products Made with Aluminum

are made with

REYNOLDS ALUMINUM

© REYNOLDS METALS COMPANY

for example

COVERED CONDUCTOR

Reynolds offers a complete line of Neoprene covered aluminum conductor—single conductor and self-supporting duplex, triplex and quadruplex cable. They provide savings in secondary distribution lines and service drops because their lighter weight speeds installation, cuts labor costs, permits longer spans. Their Neoprene covering is long-lasting and weather-resistant. As the chart shows, aluminum is also lower in material cost. And to provide fast shipment of material for emergency requirements Reynolds maintains stocks of most-used sizes.

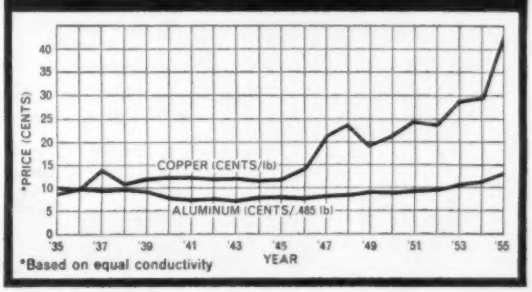
From a cost standpoint, from a product standpoint, from a service standpoint you can no longer afford not to consider conductor of aluminum. Reynolds Engineering Service—available to you in your office and in the field—is an important plus in helping you get maximum benefit from the aluminum you use. For full details on Reynolds Covered Conductor and this service—and on Reynolds ACSR, RABC (Reynolds Aluminum Bus Conductor), RESC (Reynolds Electrical Strip Conductor) and other Reynolds Products for the electrical industry—contact your nearest Reynolds Branch Office. Or write *Reynolds Metals Company, P. O. Box 1800-EL, Louisville 1, Kentucky.*

Write to address above for Reynolds prepared "Guide to the Selection of Electric Conductor Accessories" that are available from many manufacturers.

REYNOLDS ALUMINUM

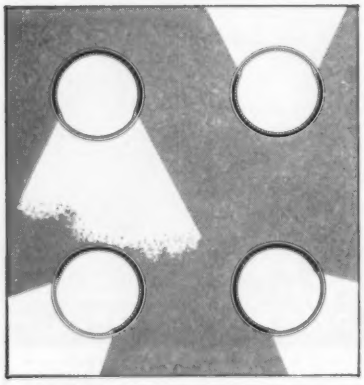
See "FRONTIER", Reynolds exciting dramatic series, Sundays, NBC-TV

TREND OF COPPER AND ALUMINUM PRICES OVER PAST 20 YEARS



SYLVANIA *Announces...*

NEW Fluorescent Lamp *with Internal Reflector*



Single-pin-type lamps are extremely flexible! The lamp may be turned in any direction so that the light is directed where it is wanted.

THIS new Directional Reflector Fluorescent Lamp is the result of research on the part of Sylvania lamp engineers to give the public better lighting in industrial and commercial applications. An internal reflector coating, covering more than half the circumference of the tube, is applied between the glass and the standard fluorescent phosphor.

More relative light! The Sylvania Directional Reflector Fluorescent Lamp increases the relative light through the aperture by as much as 60 per cent brightness.

Under service installations where dust and dirt are present, this lamp will give the user a significant increase in more useful light. It is less affected by deposits of "light-stealing" dust and dirt on the top surface of the lamp.

Many advantages! Sylvania's Directional Reflector Fluorescent Lamp may be mounted without reflectors in installations with ceilings of poor reflectance. It will step up the light output of fixture reflectors that are deteriorated by age. It saves on lamp cleaning and maintenance costs, gives increased lumen hours in supermarkets and commercial establishments using bare single-pin fluorescent lamps.

The directional lamps in production are the 48-inch and 96-inch, cool white, single-pin sizes.

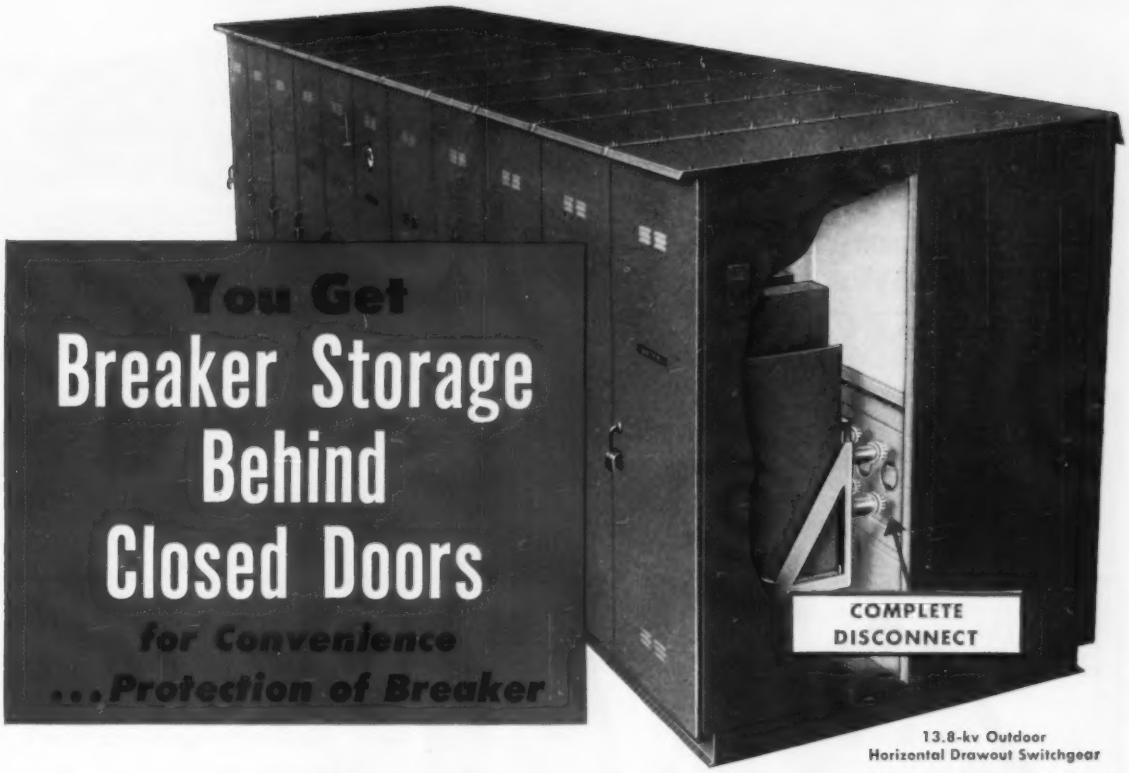
Our commercial engineering department will be glad to help you with your special application or installation problems. For complete technical data write directly to:

SYLVANIA ELECTRIC PRODUCTS INC.
Dept. 6L-2805—Lighting Division
60 Boston St., Salem, Mass.
In Canada: Sylvania Electric (Canada) Ltd.
University Tower Building, Montreal

SYLVANIA®

. . . the fastest growing name in sight

LIGHTING • RADIO • ELECTRONICS • TELEVISION • ATOMIC ENERGY



13.8-kv Outdoor
Horizontal Drawout Switchgear

You Get Breaker Storage Behind Closed Doors

for Convenience ...Protection of Breaker

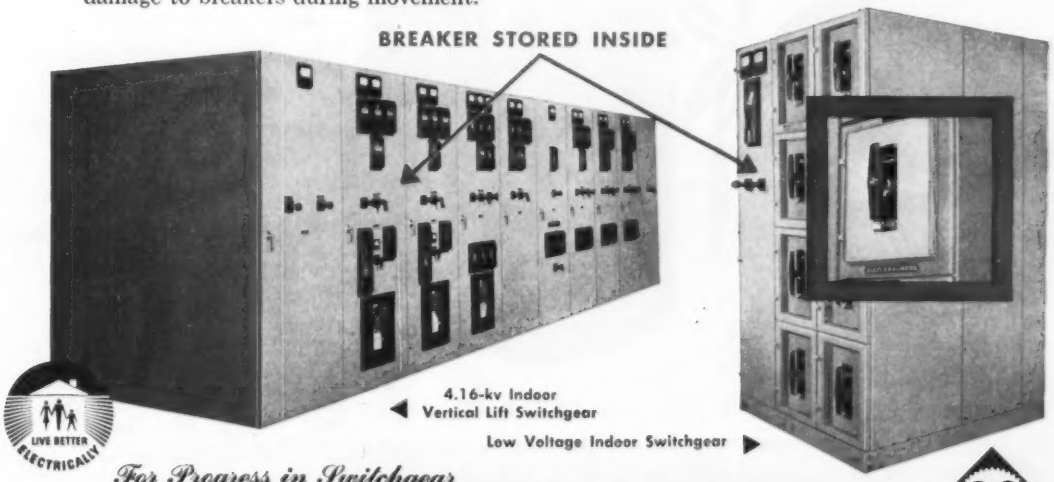
All types of Allis-Chalmers switchgear have provision for storage of fully disconnected breaker inside cubicle, with the door closed.

No special storage space is required for breakers not in use — simply disconnect the breaker and store it in its own cubicle.

This popular feature of A-C switchgear eliminates much handling and danger of damage to breakers during movement.

When breaker is in disconnected position, it is safely removed from primary and secondary contacts. Here it remains firmly fastened to withdrawal mechanism and can't move into unit accidentally.

This is only one of many features of Allis-Chalmers switchgear. For the complete story, call your nearby A-C office, or write concerning your problem to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



◀ 4.16-kv Indoor
Vertical Lift Switchgear

Low Voltage Indoor Switchgear ▶

LIVE BETTER ELECTRICALLY

For Progress in Switchgear

ALLIS-CHALMERS

A-5083

© J. H. Baxter & Co. 1956

"A hundred twenty five foot long!" Babe, the Blue Ox, dropped the tape off her left horn as Paul Bunyan whistled in amazement. His breath leveled nine young saplings. "Babe, that there's shore some Douglas Fir pole. An' she's jest as smooth an' round an' straight as the legs of a Barbary Coast dancin' gal...Babe, I *know* this'n is a BAXCO Douglas Fir Pole ✻ —without lookin' at the brand."

BAXCO
(pressure treated)
DOUGLAS
FIR POLES

✻ But it's a good idea to look for that BAXCO brand, Paul... because it means the poles were cut from choice stands (mostly our own) of Coast type Douglas Fir timber—where trees grow extra tall and straight...it means the poles were carefully seasoned, inspected, machine shaved and machine incised full length before careful pressure treatment...and when you specify "BAXCO Douglas Fir Poles" of any size, you are assured of prompt service and rigid adherence to specifications. Inquire today.

PRESSURE TREATMENTS AVAILABLE: *Creosote, Chemonite, Pentachlorophenol, in accordance with Federal and AWPA specifications.*

J. H. BAXTER & CO. *120 Montgomery Street, San Francisco 4, California*

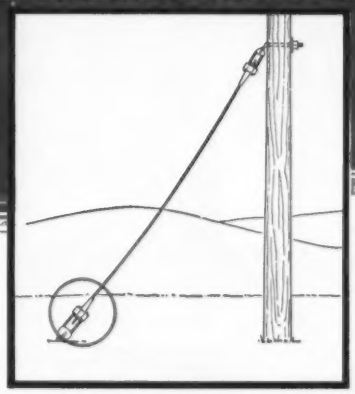
Complete a down-guy IN 5 MINUTES?

We'll bet your man can do it with . . . STRANDVISE®

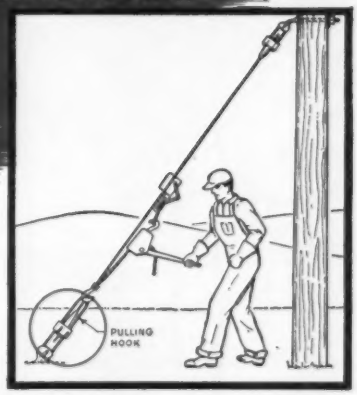
Don't take that bet until you've had some of your men try this sure, simple, easy way to install down-guys — we'll even bet that you'll be boasting that some of them can do it in less than five minutes.

FOLLOW THESE THREE EASY STEPS:
HOIST AND COME-ALONG NEED NEVER BE IN THE WAY

STEP 1 Assemble STRANDVISE to pole-top hardware and complete pole-top installation. Do not cut strand from coil; it is usually wasteful.



STEP 2 Assemble STRANDVISE to anchor eye. Measure strand hand-tight to lower end of STRANDVISE, then cut. Insert strand and feed through STRANDVISE, just hand-tight.



STEP 3 Now place come-along and hoist and apply tension. It's just as easy for double or triple guys as it is for singles.

NOW STEP BACK, THE JOB IS DONE . . .
IT'S JUST THAT SIMPLE

And here's a new pulling hook that makes the job even easier, although a pulling hook isn't needed if anchor rod will take a come-along.

Have some of your men try the Reliable STRANDVISE for easy five minute down-guy installations . . . we'll gladly supply samples for the test.

STRANDVISE — available for 3/16" through 7/16" strand, all grades. Stainless steel (rigid) and galvanized steel (flexible) bails for all types of guy attachments.

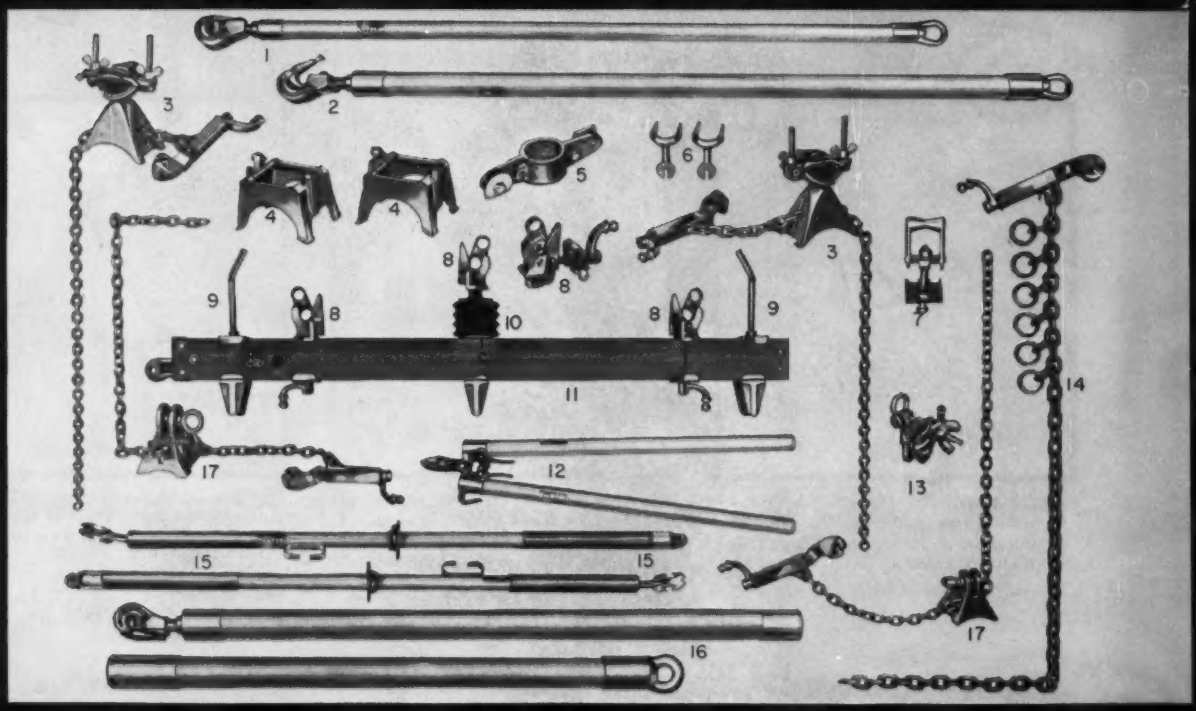
Reliable POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

ELECTRIC COMPANY 8145 CARROLL AVENUE CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES

Handle hot line jobs safely...without

KEARNEY Hi-LINE TOOLS



KEARNEY Hi-Line Tool Set No. 4778-3, consisting of:

1. Hand Pole 1½" x 10'
2. Lift Pole 2" x 10'
3. Pole Grip
4. Pole Grip Extensions
5. Brace Bracket
6. Tie Wire Heads
7. Side Arm Attachment
8. Conductor Holders
9. Line Guard Assembly
10. Insulator Conductor Holder
11. Side Arm only, 9'
12. Insulated Pliers 1¼" x 5'
13. Hand Pole Snub
14. Rope Hitch
15. Combination Tie Sticks 1¼" x 8'
16. Lift Pole 2½" x 16' spliced
17. Lift Pole Snubs

JAMES R. KEARNEY CORPORATION

4224-42 Clayton Avenue • St. Louis 10, Missouri

Canadian Plant: Guelph, Ontario

interrupting service

Service interruptions cause customer inconvenience . . . and revenue loss. KEARNEY Hi-Line Tools are designed specifically *for working hot lines safely,* by tool engineers thoroughly experienced in hot line work.

Each tool is manufactured of woods and metals selected to meet *specific* applications and uses. Each must pass rigid safety tests. This means operating safety for your crews.

If you have any unusual job or hot line problem on your system, KEARNEY's skilled field servicemen will demonstrate Hi-Line Tools and help train linemen in their use. Just say the word.

JRK-316

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify KEARNEY PRODUCTS

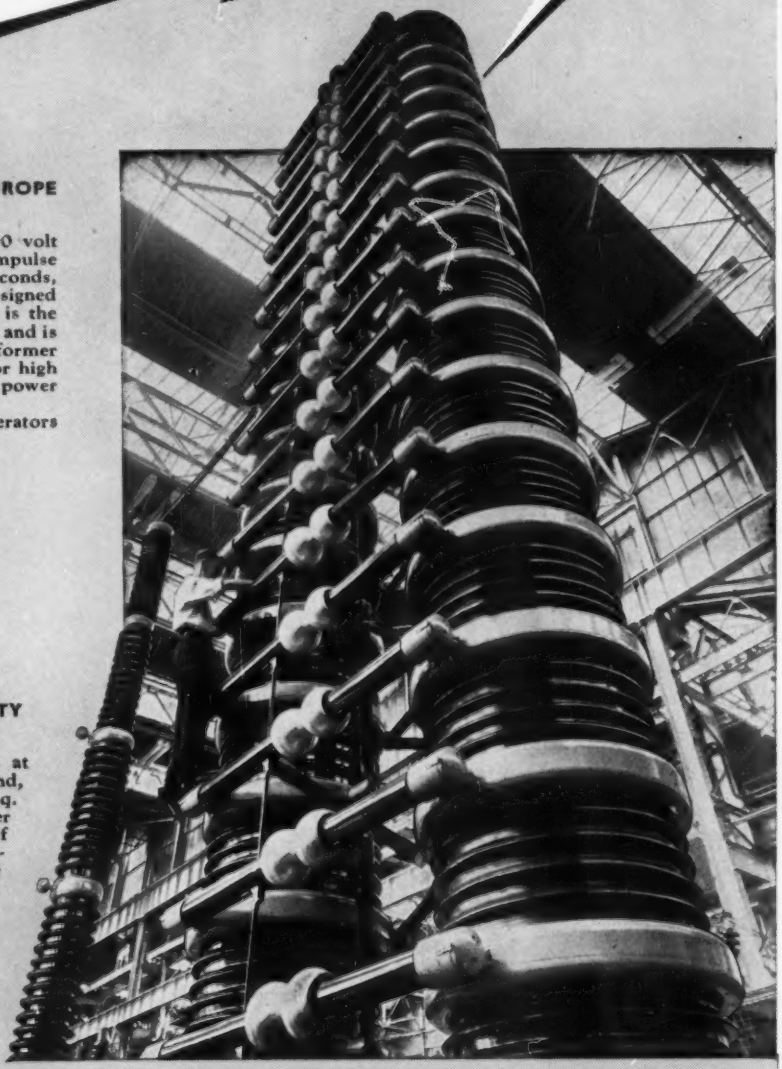
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO. GUELPH, ONT.

The Mark of Quality

4,000,000 VOLTS!

THE LARGEST
IMPULSE GENERATOR IN EUROPE

The illustration shows a 4,000,000 volt 18 stage, 2 column Ferranti Impulse Generator, energy rating 285 kW seconds, D.C. charging 220 kV per stage. Designed and built by Ferranti engineers, it is the largest impulse generator in Europe and is now installed in the Ferranti Transformer Factory at Hollinwood, England for high voltage impulse testing of large power transformers.
Ferranti High Voltage Impulse Generators are used throughout the world.



FERRANTI

OVER 5,000,000 kVA
per annum
of TRANSFORMER CAPACITY

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C. and D.C. Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

FERRANTI LTD

Head Office and Plant: **HOLLINWOOD · LANCASHIRE · ENGLAND**

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MANCHESTER, ENGLAND: Ferranti Ltd., Moston, Manchester 10
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FT 176/2

CUT DOWN INSTALLATION TIME² with

BLACKBURN *Hi-Strength* TWO-BOLT CLAMPS

One piece construction simplifies installation—eliminates assembly problems—no falling parts—no missing pieces—no special tools necessary. Available in copper or heavily tin plated—with or without contoured spacer.

Long bolt is peened, capturing spacer and top casting. Spacer is ringed and swings easily over conductor. Free bolt is held in place by neoprene washer during installation.

Contoured spacer keeps conductor in original shape and distributes unit pressure over large area of conductor, minimizing cold flow and provides wide separation between the aluminum and copper conductor, reducing possibility of galvanic corrosion.

Shakeproof washers prevent loosening under the most severe operating conditions. Washers, castings, bolts and spacers are of copper alloy, completely tin plated.

Write today for complete specifications and prices on Blackburn Two-Bolt Clamps.

JASPER BLACKBURN CORPORATION

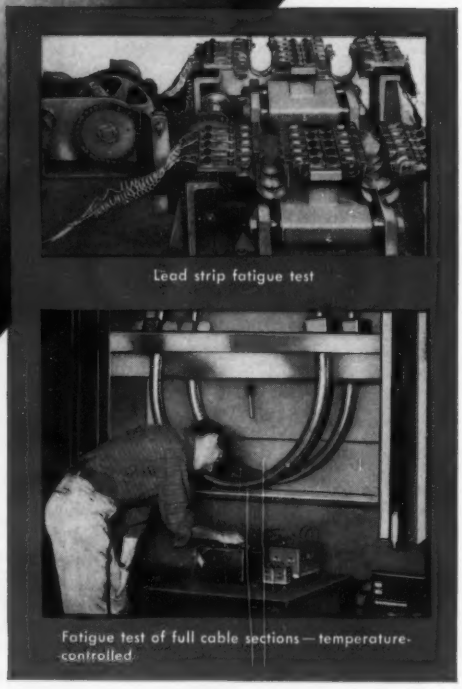
55 MADISON • ST. LOUIS, MO. • PHONE: MAIN 1-2821

ROEBLING PAPER POWER CABLE WITH TELLURIUM LEAD ALLOY SHEATH

TELLURIUM LEAD ALLOY SHEATHS MEET ALL REQUIREMENTS FOR FATIGUE RESISTANCE

TODAY'S HIGHER TEMPERATURES and increased loads are power cable problems met most satisfactorily and economically by Roebling Tellurium Lead Alloy Sheath. This sheath has absolutely top fatigue resistance; gives vastly increased service life despite severe bending stresses and cable movement during load cycles. Furthermore, Roebling Tellurium Lead Alloy has outstanding stability under heat—high temperature incurred at joints, terminations and in duct splicing cause no grain growth or physical impairment.

Roebling is unmatched in the breadth of its experience with Tellurium Lead Alloy Sheath and in the volume of cable it has produced with this remarkable sheathing. We will welcome the opportunity to send you Bulletin 205-B containing technical data on Roebling Tellurium Alloy Sheaths.



Lead strip fatigue test

Fatigue test of full cable sections—temperature-controlled

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

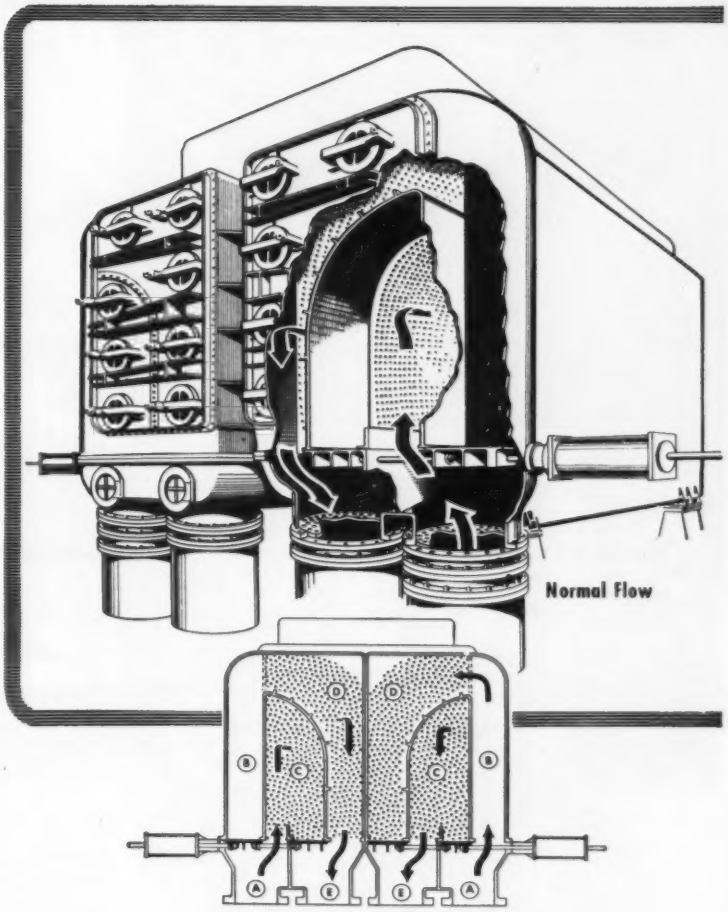
JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 3253 FREDONIA AVE. • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. • ODESSA, TEXAS, 1930 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. • SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

REVERSE FLOW by C. H. WHEELER
Cleans Steam Condenser Tube Sheets Without Loss of Load

When debris and organic growth collect on the tube sheets of a C. H. Wheeler Patented Reverse Flow Steam Condenser, you don't have to shut it down for cleaning. It cleans itself—without loss of load. Sluice gates arranged within the condenser may be controlled, either electrically or hydraulically, to reverse the flow of cooling water through the tubes. This sudden reverse flow literally flushes away leaves and debris, dislodges crustaceous matter from clogged tubes.

Because of 100% water flow during back flushing, there is only a negligible dip in vacuum momentarily, thus permitting continuous load on the turbine The Reverse Flow Condenser cleans itself in minutes, compared with hours of downtime when tube sheets are manually cleaned. A typical report shows a half-inch loss of vacuum (due to fouled tubes and tube sheets) was restored in five minutes after reversing the flow of cooling water. Often, a C. H. Wheeler Reverse Flow Condenser goes two years or more without shut down for cleaning, depending on the condition of the cooling water.

New, exclusive deaerating features and construction techniques help make C. H. Wheeler Steam Condensers "First in Efficiency." Let C. H. Wheeler Custom Engineer your next steam condenser. Phone or write C. H. Wheeler Manufacturing Co., 19th & Lehigh, Philadelphia 32, Pa. . . . Manufacturers of Steam Power Plant Condensers • Vacuum Equipment • Marine Auxiliary Machinery • Water Supply, Drainage and Circulating Pumps.



HOW "REVERSE FLOW" WORKS

Left Side Shows Normal Operation

Water enters inlet A with right port open. Flows through tube bank C to rear of condenser . . . returns through tube bank D to front of condenser and discharges at E.

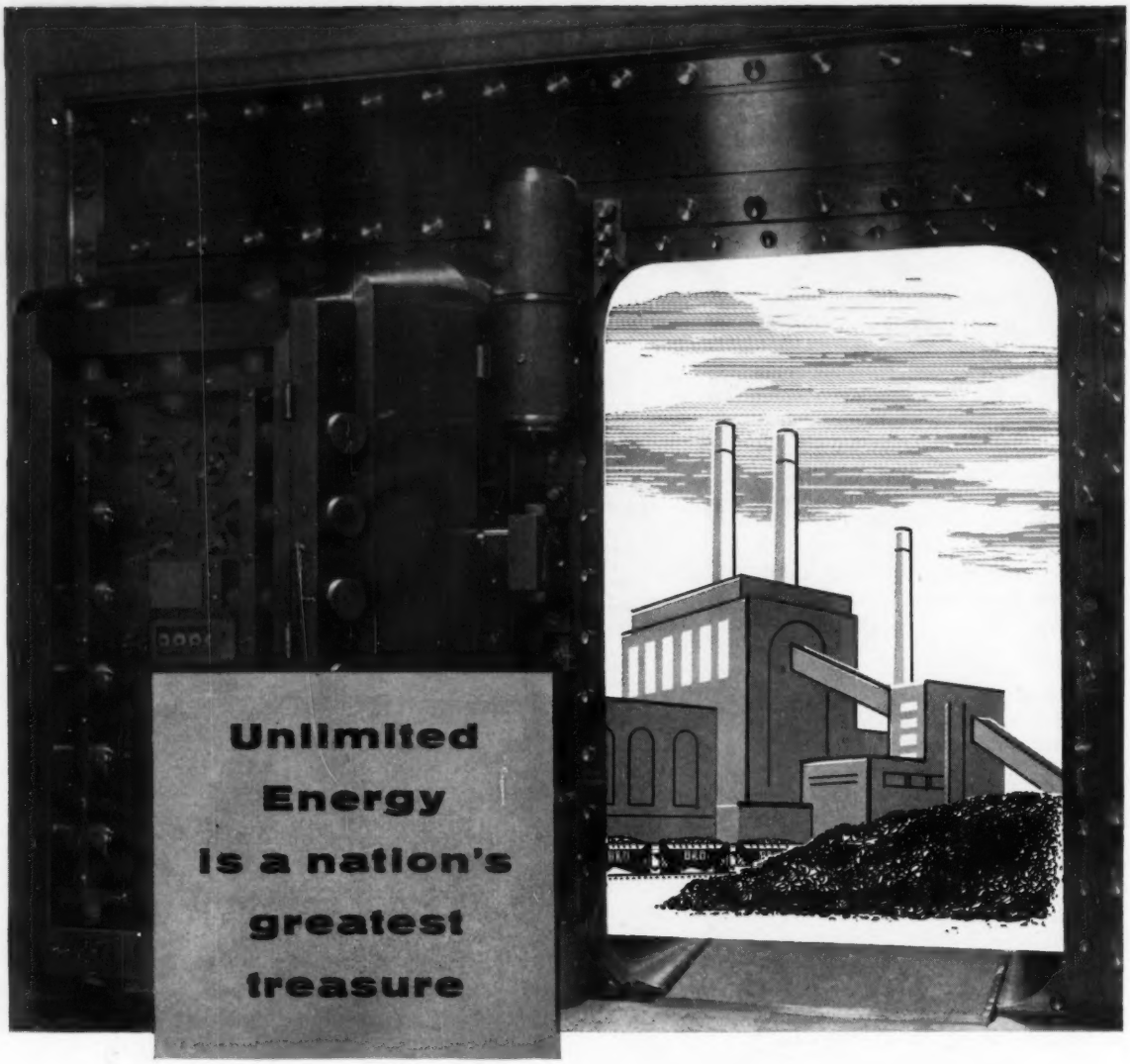
Right Side Shows Reverse Flow

Sluice gates move on a common stem. Water flows up through channel B, and through tube bank D to rear of condenser . . . returns through tube bank C to front of condenser.

In the C. H. Wheeler Divided Water Box Design, each half of the condenser can be back-flushed independently.

WE603

C.H. Wheeler OF PHILADELPHIA



Modern industrial might comes from nature's harnessed energy. This nation's greatest single energy resource is found in its tremendous reserves of Bituminous coal.

As population increases—as living standards rise, vast additional amounts of energy will be required—and found in Bituminous—*the fuel with a future.*

Fields served by B&O contain known reserves of more than 8 billion tons suitable for every purpose. The nation can safely *bank on bituminous* treasure like this and on B&O operators to mine and supply it in greatest quantities, with increasing efficiency at stable-low-cost. *Ask our man!*

Let our Coal Traffic Representative suggest
a constant-low-cost Bituminous coal for your needs—
COAL TRAFFIC DEPARTMENT
B&O RAILROAD • BALTIMORE 1, MD.
LExington 9-0400

Baltimore & Ohio Railroad

BITUMINOUS COALS FOR EVERY PURPOSE

VALUES TO LOOK FOR IN 2-WAY RADIO . . .

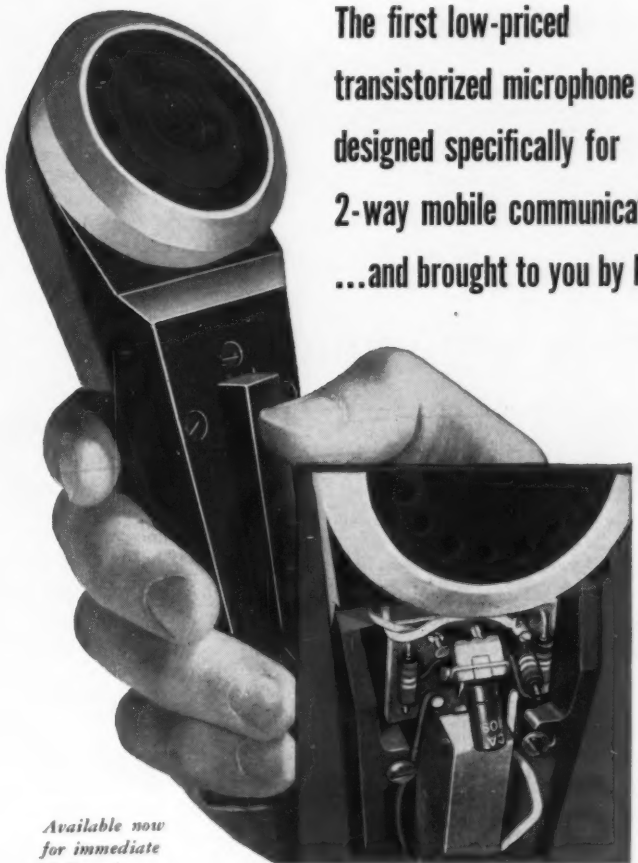
LOOK FOR THE NEW transistorized microphone

AVAILABLE IN NEW RED-HEADED MODEL

- Transistors' basic attributes of minuteness, ruggedness and low power requirements make possible built-in pre-amplifier, permitting full interchangeability with conventional carbon microphone.
- Higher fidelity. Appreciable improvement in intelligibility, voice quality and reliability. Minimizes the possibility of noise pick-up in microphone cable.
- Designed to fit the hand . . . left or right, small or large, bare or gloved. Easy to grasp and hold. Slip-proof grip.
- Easy to use. Positive-action bar switch is of ample length, sturdy and convenient.
- Hangs easily. Clips into metal hanger as standard equipment. Rubber cup holder also available if desired.
- Ruggedized construction. To withstand shock, impact, heat, cold, humidity. Microphone element "packaged" for quick and easy replacement and maintenance.
- Distinctive appearance. Bright red mouthpiece and rugged black plastic case, rimmed with aluminum.
- Built to last. High-impact Bakelite case, guaranteed against breakage for 5 years. Switch, with self-wiping contacts, stands up in all kinds of weather.

RCA . . . world leader in radio . . . offers you quality equipment to meet your requirements . . . from mobile radio units, installed in trucks and service vehicles, to station radio for the dispatcher's office. Advanced engineering means greatest satisfaction . . . lowest maintenance. Expert service by RCA Service Company to assure peak performance.

DISPATCHER 2-WAY RADIO TO DRIVER



The first low-priced transistorized microphone designed specifically for 2-way mobile communications ...and brought to you by RCA!

Available now for immediate delivery!

RADIO CORPORATION of AMERICA
COMMUNICATIONS PRODUCTS
CAMDEN, N.J.

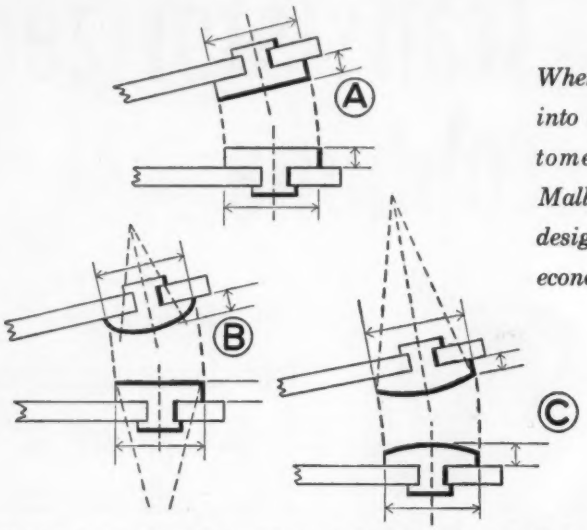
Radio Corporation of America
Communications Products, Dept. EC-45, Building 15-1, Camden, N. J.

- ☐ Please send me specifications and prices on RCA Transistorized Microphone.
- ☐ Please send me complete information on the use of 2-Way Radio in_____

NAME_____ TITLE_____
COMPANY_____
ADDRESS_____
CITY_____ ZONE_____ STATE_____

- ☐ Have RCA Communications Specialist make a free RADIO SURVEY of my business.

MALLORY



When Original Design A ran into alignment trouble, the customer proposed design B. Mallory engineers recommended design C as the most efficient and economical solution.

How economical are *your* contact designs?

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design** . . . for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** . . . in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

DESIGN of electrical contacts is an engineering job in which Mallory's specialized experience can often lead to substantial savings for you. A case in point—a manufacturer of circuit breakers wanted to use a combination of flat and radius-faced contacts to lick an alignment problem in production. This design required buying and stocking of two separate contact parts.

Mallory contact engineers came up with a money-saving improvement. They recommended a modified radius design to go on both the stationary and moving contacts. Substantial production time was saved by elimination of the alignment difficulty in assembly. In addition, by buying a *single* type of contact engineered for the job, instead of two separate designs, the manufacturer cut his inventory problem in half, simplified purchasing and handling, and saved a significant percentage of direct contact cost as well.

There's a good chance that you can realize comparable savings on your own contact applications, by bringing your problems to Mallory specialists. The complete engineering job that our staff can undertake will assure you of gaining the maximum in performance . . . at the peak of economy . . . for your specific requirements. For a consultation, write or call Mallory today.

Expect more . . . get more from

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Television Tuners • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals and Ceramics • Welding Materials

P.R.MALLORY & CO. Inc
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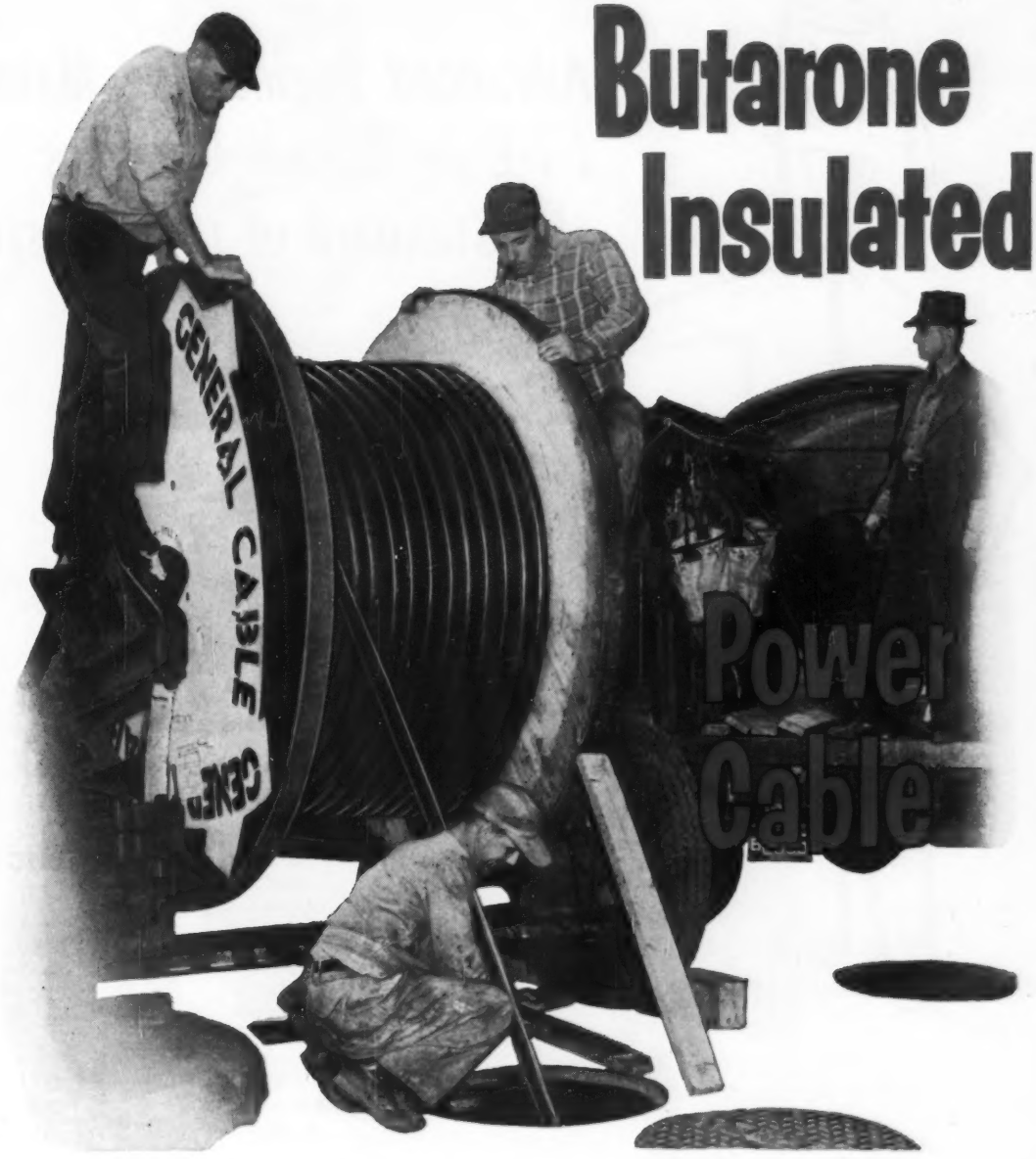
Butarone Insulated



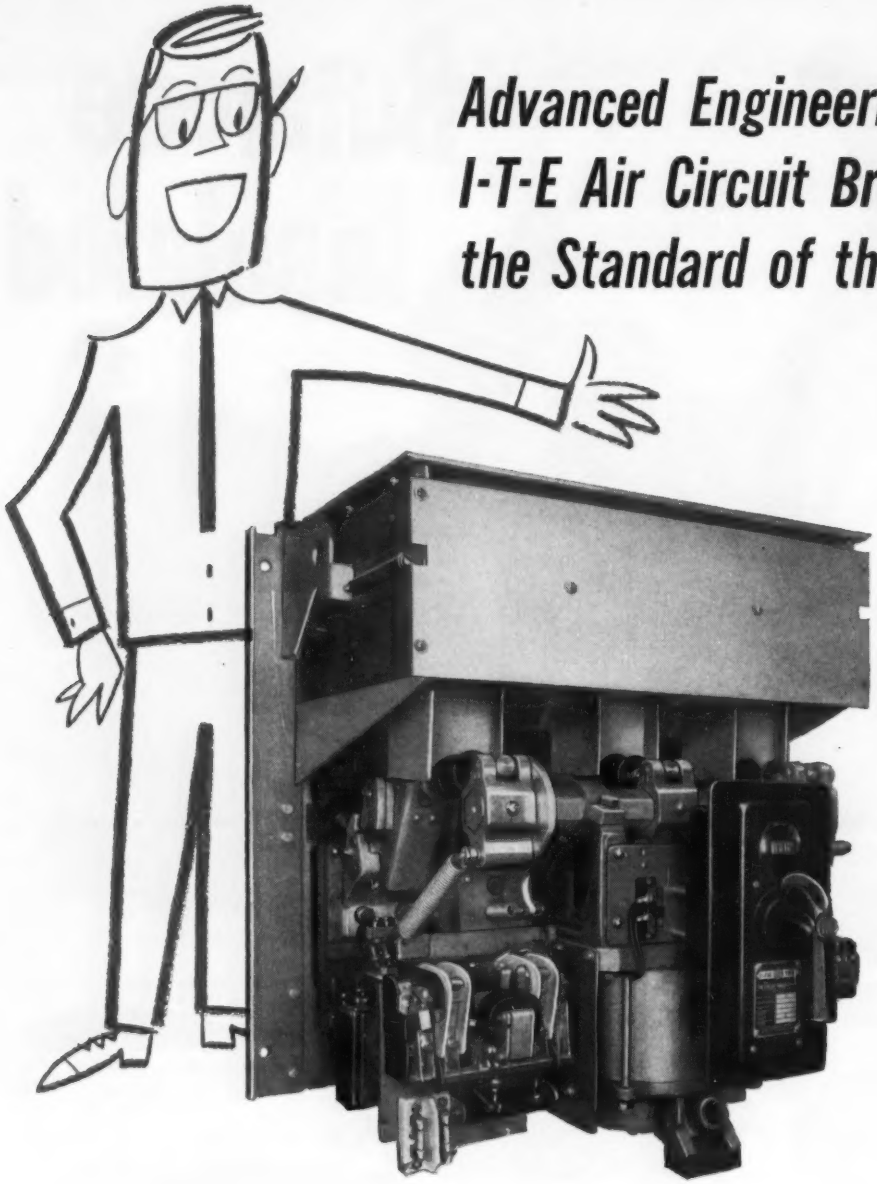
A BUTYL COMPOUND developed for high voltage insulation to insure superior resistance to ozone, heat and moisture. Manufactured under the most exacting standards to insure trouble-free operation.

BUTARONE insulation is rated at 85°C for voltages up to 17KV.

General Cable

. . . at your service!

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast



Advanced Engineering Makes I-T-E Air Circuit Breakers the Standard of the Industry

New design extends K line through 4000 amp continuous and 150,000 amp interrupting capacity

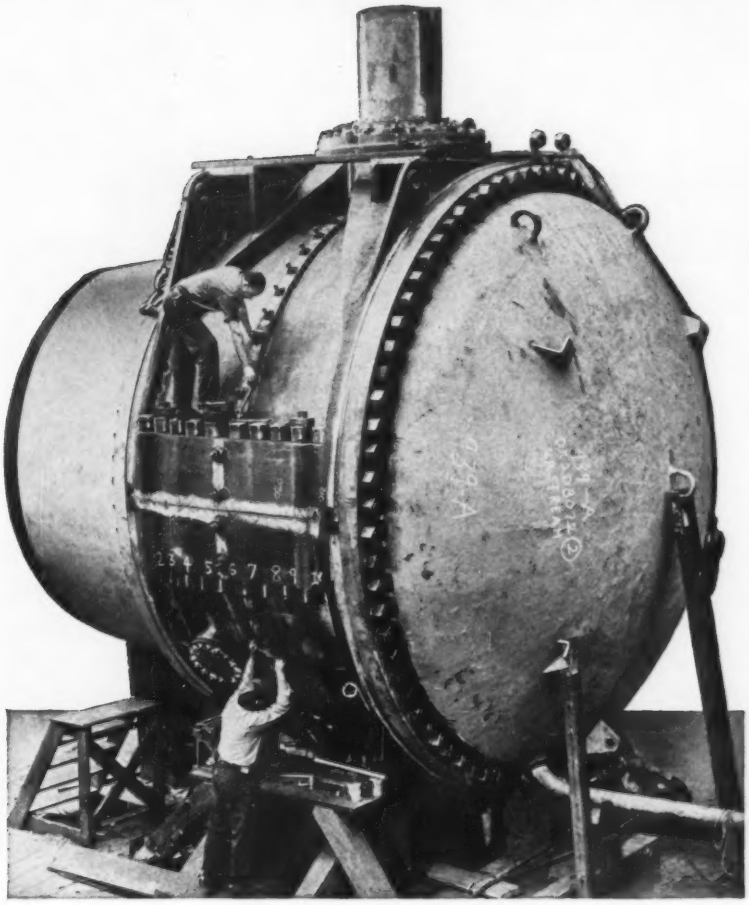
Here are some of the extra features that make the new K line of I-T-E circuit breakers the standard of the industry:

- Compact arc chutes designed to provide fast, efficient arc interruption
- Contact structure utilizing silver-alloy, wiping action, sturdy construction and blow-on arrangements to assure superior interrupting ability, and long life
- Dual magnetic overcurrent trip, dual selective overcurrent trip, and other auxiliary devices
- Standardized location of all tripping devices, solenoid relays, auxiliary switches and terminal blocks

For the complete story of I-T-E superiority, contact your local I-T-E representative. Or write for Bulletin 6004B, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Phila. 30, Pa.

I-T-E

I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division



This 16-Foot Butterfly Valve Illustrates the type of work which Newport News takes in stride. Newport News built 3 such valves, each weighing 446,000 lbs., for the Ross Power Plant, Skagit Project, Department of Light, City of Seattle, Washington. Designed for a water flow of 3,620 cu. ft. per sec., and a hydrostatic pressure of 290 psi., these valves were shop tested by Newport News at 450 psi. They are hydraulically operated with oil at 1,500 psi. pressure. Shop tests assure speedy, trouble-free assembly of Newport News built equipment, on the site.

The TEST of a TITAN

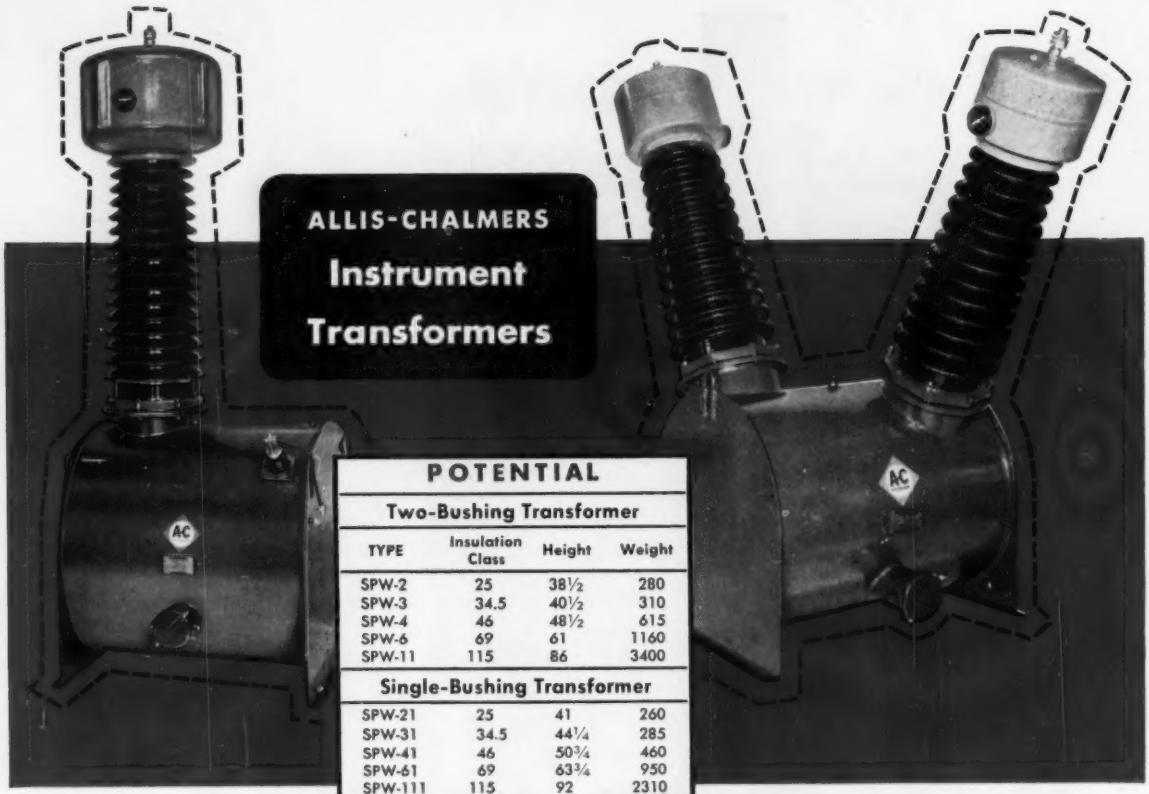
Here is one of the largest high head butterfly valves ever built, undergoing a shop test at Newport News. If you had an opportunity to follow this unit from start to finish, you would see *first hand* how Newport News produces massive equipment *economically*. For economy is a basic advantage that results from Newport News' high integration of skill and production facilities.

Large engineering and technical staffs, operating a plant comprising acres of brass, iron and steel foundries, five huge machine shops and other extensive fabricating facilities, have made Newport News one of the world's largest producers of hydraulic turbines, valves, gates, penstocks and other essential equipment... both standard and special in design.

Let us bid on your equipment. Write us today for your copy of *"Water Power Equipment."*

NEWPORT NEWS

SHIPBUILDING AND DRY DOCK COMPANY
Newport News, Virginia



POTENTIAL			
Two-Bushing Transformer			
TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400
Single-Bushing Transformer			
SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

Advanced Design Features Mean...

Savings in Size and Weight

Now, reductions in size and weight make Allis-Chalmers potential transformers easier to handle—simplify installation procedures.

Compact Design results in improved performance in both ratio and phase angle.

New Ratings. This line of potential transformers has also been expanded to include higher voltage insulation classes.

Advanced Corona-Free Design principles enable these transformers to withstand long continued voltage stresses and short-time surge conditions. Internal corners and coil edges are protected by formed insulating channels which fit close to coil surfaces —effectively prohibiting formation of corona and the development of leakage paths.

Maintenance-Cutting Construction Features are incorporated, such as all-welded, hermetically sealed tanks to extend life of coils and insulation. The new one-piece high voltage porcelain bushing incorporates the same corona-free design features that are used in the transformer, thus assuring long trouble-free life.

Get All the Facts on these modern, lightweight transformers. Contact your nearby Allis-Chalmers district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for more information.

LIVE BETTER ELECTRICALLY

A-5087

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Cables that sing through the storm

It's a utility engineer's nightmare . . . wires, crossarms and poles encrusted with snow and ice. High winds . . . flickering lights . . . then darkness.

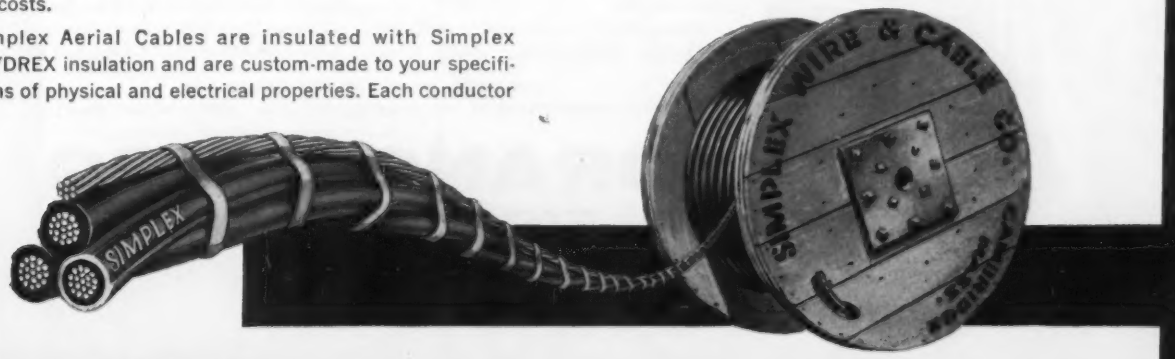
There is a wealth of assurance in installing Simplex-ANHYDREX Aerial Cables. You know they'll operate safely and dependably in any kind of weather—in many cases, even when poles come crashing down.

For many years now, engineers have been replacing power and communication line wires with Simplex Aerial Cables. Supported by steel messengers, these cables free poles from crossarms and clutter, and eliminate the need for frequent tree trimming. This reduces both installation and maintenance costs.

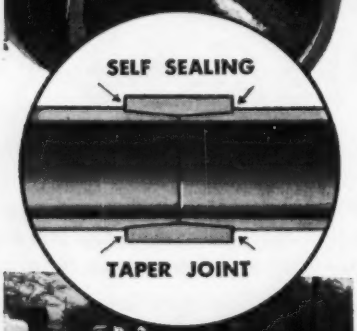
Simplex Aerial Cables are insulated with Simplex ANHYDREX insulation and are custom-made to your specifications of physical and electrical properties. Each conductor can be phase marked to minimize tapping and splicing problems.

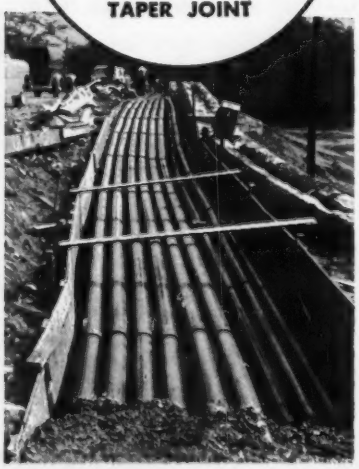
Most Simplex ANHYDREX Aerial Cables have tough, lightweight neoprene jackets that protect insulated conductors from abrasion, fungus, heat, sunlight, chemicals, corrosion and weathering.

Qualities like these make Simplex Aerial Cables sing with power—without interruption. Be sure to get them every time you buy cable for power and communication service. Write today for Booklet 1006. **SIMPLEX WIRE & CABLE COMPANY,** 79 Sidney Street, Cambridge 39, Mass.



SMOOTH BORE!





Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-56 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT

SUBSTATION STRUCTURES

One Responsibility
FROM DESIGN TO DELIVERY!

INDUSTRIAL INSTALLATION

R&IE

CENTRALIZED SUBSTATION SERVICE

Check the facts!

1. **DESIGN** layout, detail complete.
2. **FABRICATION** complete in R&IE shop.
3. **GALVANIZING**—new controlled methods.
4. **SWITCH ASSEMBLY** — from foundry and all machining operations, R&IE controls the entire manufacture ready for delivery.
5. **VERSATILITY** to solve any special problem. Illustration shows typical industrial application of R&IE design.

R&IE EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

INDOOR BUS SUPPORTS and BUS FABRICATION • OUTDOOR BUS SUPPORTS and AIR SWITCHES • SUBSTATION STRUCTURES—steel or aluminum • TESTING DEVICES • KIRK KEY INTERLOCK SYSTEMS • ISOLATED PHASE BUS STRUCTURES • INTERRUPTER SWITCHES

A DEPENDABLE COMBINATION

Westinghouse Bus Duct—made with Kaiser Aluminum Bus Bar—offers many advantages that result in better bus duct systems. Among these advantages are:

Application flexibility—Westinghouse Bus Duct using aluminum bar is normally applicable to all installations where duct using copper bar is currently used. There are distinct advantages to consider when comparing the use of aluminum with copper in any particular application.

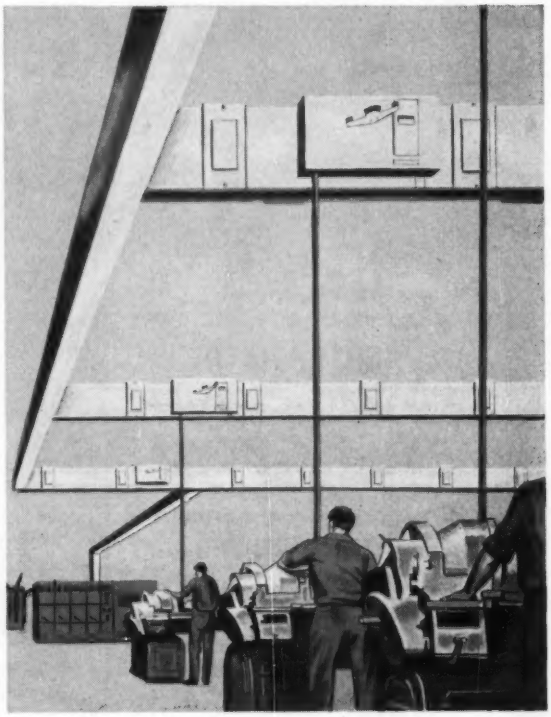
Up to one-third less weight—the cross-sectional area of aluminum bus bar for comparable current capacity is only slightly greater than that of copper bus bar. But, aluminum is a little less than one-third the weight of copper by volume. Thus, a 10-foot section of bus duct using aluminum bar is approximately 30% lighter than a 10-foot section of bus duct using copper bar.

Easier handling—Lighter weight and easier handling go hand in hand. Every step of the way from transporting to installing, personnel find the lighter weight of aluminum a distinct advantage.

Lower first cost—At present approximately 10% saving over equivalent copper duct can be realized. Increased use resulting in lower manufacturing costs will increase this saving still further.

Lower installation cost—This is primarily due to being able to handle bus duct using aluminum bar with greater ease. Less time is required to get the duct in place.

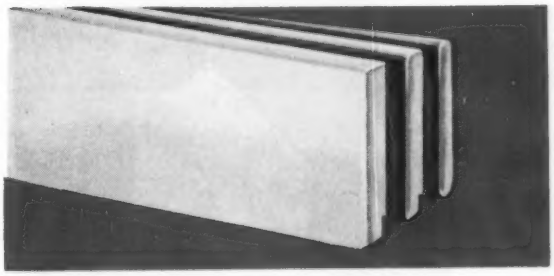
Lighter floor loading—This is another benefit of lighter weight of particular value when bus duct is used as part of a modernization program, especially when it comes to installing duct as vertical risers in commercial buildings. Aluminum bus duct is the answer.



In addition, Westinghouse has built in the same assurance of low resistance joints that are available in duct fabricated with copper bar. Each bar is electrolytically silver plated over its entire length to provide the same consistent low contact electrical resistance which

KAISER WIRE

FOR BETTER BUS DUCT SYSTEMS



is stable over long periods of time under varying operating conditions. In performance it is equivalent in every respect to copper bus duct and meets the same NEHA & U/L standards.

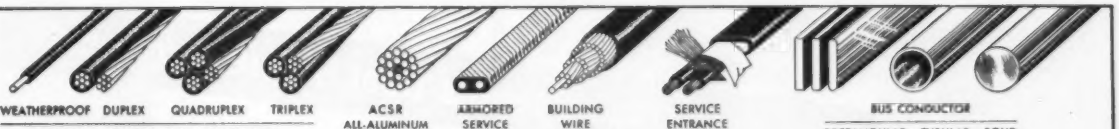
Detailed information on Westinghouse Aluminum Bus Duct can be obtained by writing to Westinghouse Electric Corporation, 3 Gateway Center P.O. Box 868, Pittsburgh 30, Pennsylvania.

• Aluminum's unique combination of useful properties make Kaiser Aluminum Bus Conductor ideal for use in industrial plants, commercial buildings, central stations and substations. Among its advantages are high conductivity, light weight, corrosion resistance, workability, strength, availability and economy.

To assist manufacturers, utilities, architects and engineers in the conversion to aluminum bus, Kaiser Aluminum makes available a large range of shapes, alloys, and sizes of aluminum bus conductor—including rectangular, tubular, and solid round bus. Ask for free booklet "Kaiser Aluminum Bus Conductors"—containing valuable information on types and advantages, availability, electrical properties, physical properties, bending, corrosion resistance, joining, and silver plating.

Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office,* Palmolive Bldg., Chicago 11, Illinois; *Executive Office,* Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum



"I'm burning these ten-spots," said Hodge,
Burning bills in his big truck garage,
"To show how we lose,
When a new truck we choose,
Without first having checked on Dodge!"

QUICK QUIZ FOR TRUCK BUYERS

Try this quick quiz before you buy your next truck—and you'll get a better truck for your money:

Q. **What truck line offers you *today's lowest prices* on such popular models as the ½-ton panel, the 1-ton express, and the 1½- and 2-ton stakes?**

Q. **Which truck line has the largest cabs?**

Q. **Which has the greatest driver visibility?**

Q. **Which has the shortest turning radius?**

The answer is "Dodge"—leader for the last 39 years. And this year "Dodge" is the answer to virtually every question you can ask that has to do with lower cost haulage or delivery.

You'll find Dodge trucks are the best answer, too, on price. For Dodge trucks are priced so competitively that no one can beat your Dodge dealer's deal.

When time comes to buy your next truck—get the answers that will lead you straight to today's best truck value—Dodge.

DODGE
Job Rated
TRUCKS
WITH THE *FORWARD* LOOK

Get the Dodge Dealer's Deal Before You Decide

Get Voltage Data the Continuous Low-Cost Way with Lincoln Voltmeters

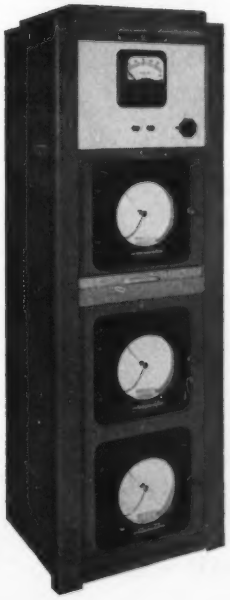
You can't give proper service without proper voltage. And rapid load growth has made expensive, periodic surveys unreliable.

Permanent installations of Lincoln *Indicating* Voltmeters provide a constant record of maximum and minimum voltages for all interested personnel at low capital investment.

Lincoln *Graphic* Voltmeters are available for use where more detailed information of time and duration of voltage is required.

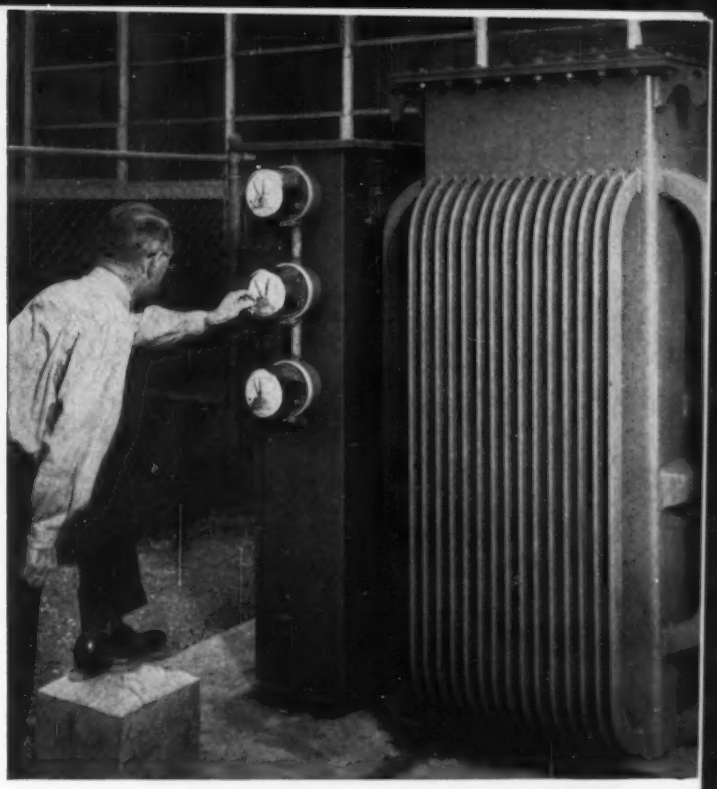
Get the whole story—write for "Solving Distribution System Problems through Measurement."

SANGAMO ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

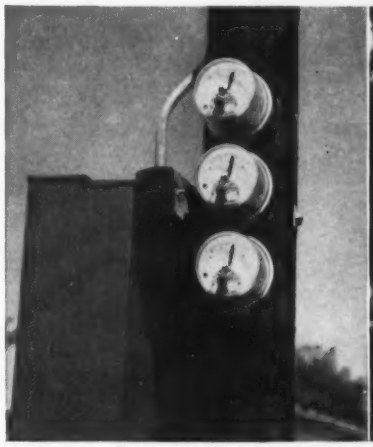


Lincoln graphic voltmeters with monthly charts tell operating manager of phase voltages at primary substation.

Complete information is obtained on circuit conditions with Lincoln meters measuring watts, vars, amperes, and volts.

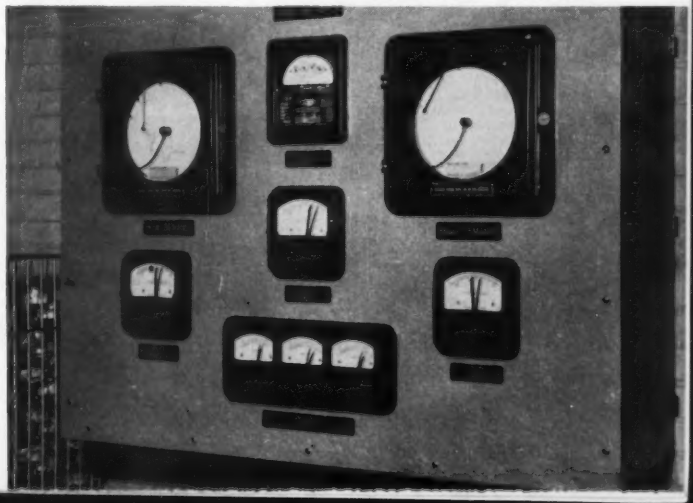


Voltage and current in this three phase transformer are being measured with a Lincoln V2S Voltmeter and two Lincoln ADS Ammeters.



Three V2S Voltmeters check supply voltage at metering point to an industrial power customer.

Minimum and maximum voltage continuously checked on singlephase residential circuit with Lincoln Voltmeter.



SMSS-1

HERE'S ANOTHER WAY...

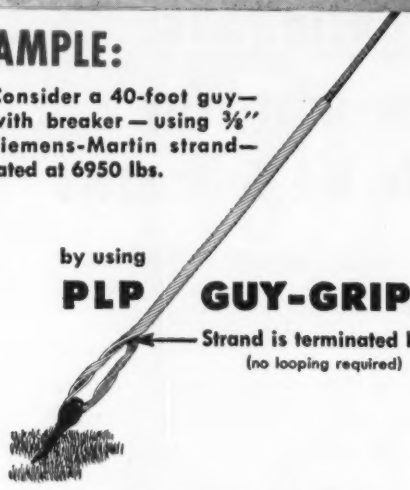
Preformed Guy-Grips CUT GUYING COSTS!

EXAMPLE:

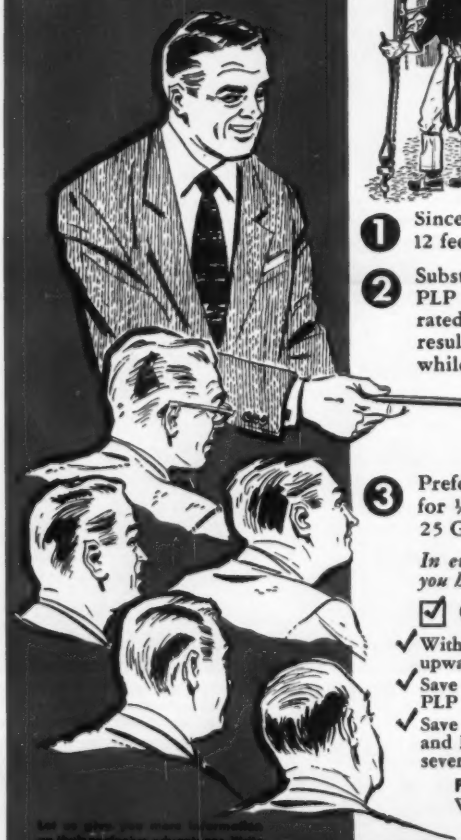
Consider a 40-foot guy—with breaker—using 3/8" Siemens-Martin strand—rated at 6950 lbs.

by using

PLP GUY-GRIPS



Strand is terminated here
(no looping required)



1 Since PLP Guy-Grips eliminate looping, strand saving of 12 feet or more per guy results. **SAVING: $.67 per guy**

2 Substitute 1/4" Extra High Strength Strand—rated 6650 lbs. PLP Guy-Grips make this possible since they hold the full rated strength of E.H.S. Strand. The following strand savings result (current cost of 3/8" galvanized strand is $2.24 per guy while 1/4" E.H.S. costs $1.36 per guy)*: **SAVING: $.88 per guy**

TOTAL STRAND SAVING ALONE: $1.55 per guy

3 Preformed Guy-Grips cost only $.55 each for 1/4" E.H.S. Strand size. (PLP Cat. No. 25 GDE-1/4")

Compare this cost with your current fitting.

PLUS LABOR SAVINGS

In every Preformed Guy-Grip installation, you hold the full strength of the strand.

☑ CHECK THESE ADDITIONAL SAVINGS:

- ✓ With PLP Guy-Grips, leading utilities estimate installation savings upward of 50%.
- ✓ Save an additional 10% by using 3-wire strand instead of 7-wire. PLP Guy-Grips will hold 3-wire strand equally well.
- ✓ Save space and inventory costs by standardizing on PLP Guy-Grips and lighter E.H.S. Strands. One size strand can be substituted for several sizes and grades previously used.

PLP GUY-GRIPS ARE ALSO AVAILABLE IN COPPER-WELD, BRONZE, AND STAINLESS STEEL.

**Based on current strand prices—75,000 feet to carload lots.*

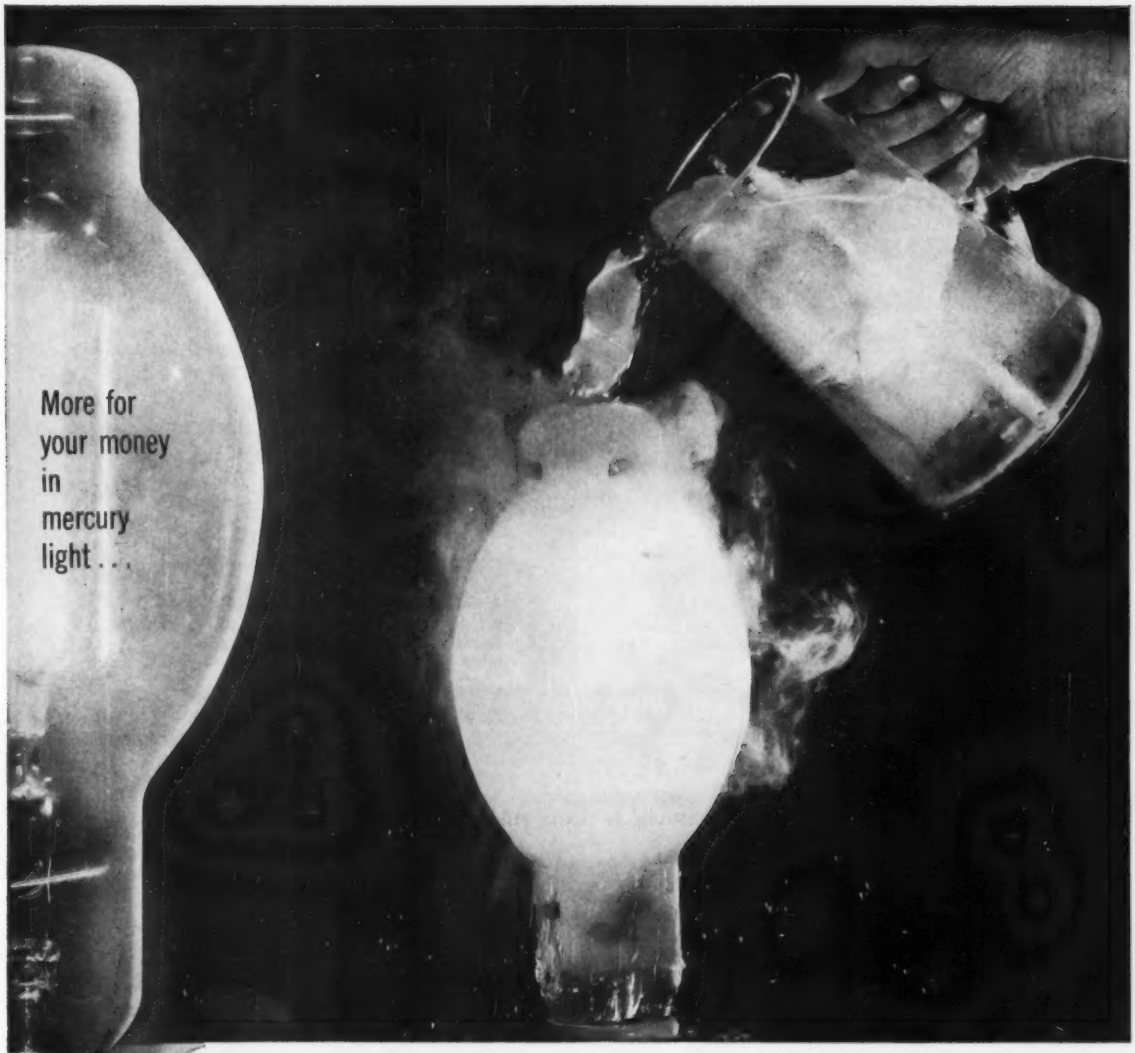
Let us give you more information on their exclusive advantages. Write or call Preformed Line Products Company; Call EXpress 1-3571.

PLP GUY-GRIPS DON'T SLIP . . . even under impact!

Made in accordance with or for use under one or more of the following U.S. Patents: 2,353,010; 2,383,393; 2,609,033; 2,691,805; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY
5349 ST. CLAIR AVENUE • CLEVELAND 3, OHIO



ANNOUNCING NEW WESTINGHOUSE WEATHER DUTY(TM) MERCURY LAMPS

Down again go your lighting costs as Westinghouse announces another basic improvement in high-intensity mercury lamps. It's the world's first line of *weather-resistant*, heavy-duty mercury lamps.

Made with hard, tough, thermally stable glass, new Westinghouse WEATHER DUTY Mercury Lamps can be burned outdoors unprotected in rain, snow or sleet with no risk of cracking. And they can be burned indoors in ventilated fixtures with no danger of shattering under water drops entering through the ventilating openings. Moreover, they are highly resistant to mechanical breakage and to the corrosive effect of industrial fumes.

Thus in any type of installation—indoor or outdoor—Westinghouse WEATHER DUTY Mercury Lamps save you money three new ways. First, by eliminating the need for protective shields and permitting the use of cheaper fixtures. Second, by doing away with costly shield maintenance. And third, by releasing the large amount of light wasted by dirty shields.

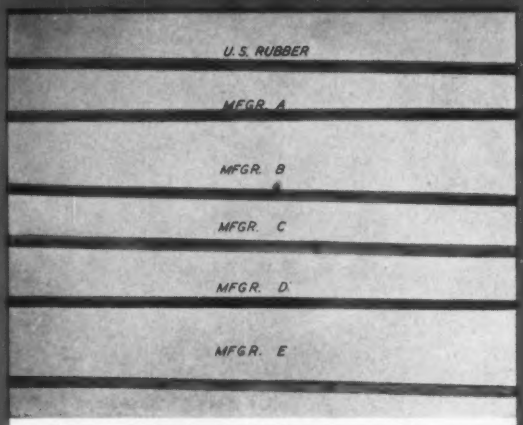
WEATHER DUTY Mercury Lamps are the latest example of how Westinghouse gives you *"more for your money in mercury light."* Now available types E-H1-WD, J-H1-WD, A-H12-WD, C-H12-WD, A-H15-WD and B-H15-WD.

WESTINGHOUSE GUARANTEES the service life of all its widely used types of quartz mercury lamps. For full details call your Westinghouse Lamp Representative—or write Westinghouse Lamp Div., Dept. EW-3, Bloomfield, N. J. "You can be sure if it's Westinghouse."

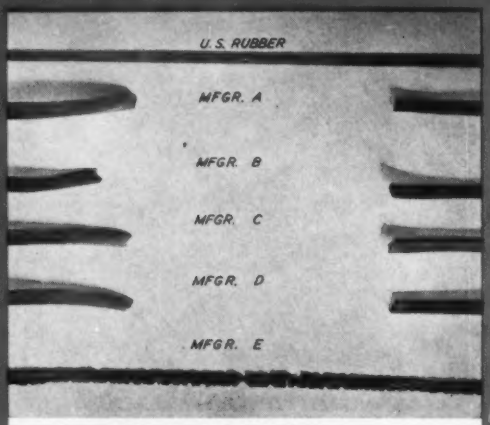
WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***

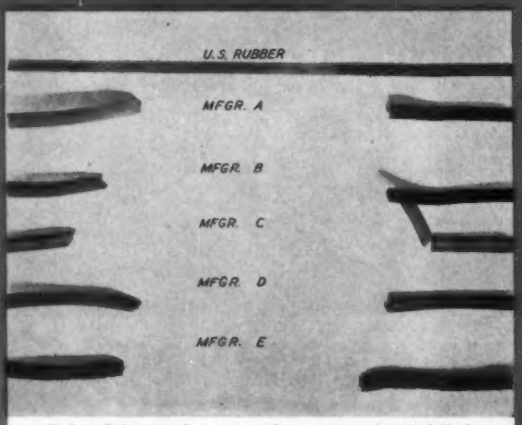
Grizzly High Voltage Power Cables



Here are 6 samples of widely used competitive neoprene jackets (stretched 200% of original length) at start of test for ozone resistance.



2 hours, 23 minutes after start. Brand "E" is disintegrating. Brand "B" has failed 13 minutes ago; the other brands failed an hour or more before.



Taken 7 hours after start of test—Brand "E" failed after 2 hours, 30 minutes. U. S. Grizzly Power Cable's jacket showed practically no sign of damage. It did not fail until after 18 hours of exposure.

Proved far and away the winner in an Ozone test of 6 leading competitive jackets!

U. S. Grizzly® High Voltage Power Cables are unmatched in performance, durability and all-around economy. Order these superior cables from your "U. S." branch, distributor or write Electrical Wire & Cable Department, United States Rubber Company, Rockefeller Center, New York 20, N. Y.

Obsolete wiring can cause power failure, step up expense and push down your production. That's why it's important to make sure your plant is equipped with Adequate Wiring—adequate not only for today's needs but also for the increased electrical loads needed in your future growth.

Electrical Wire & Cable Department

United States Rubber

ten million jerks a year...

can't shake these connections loose

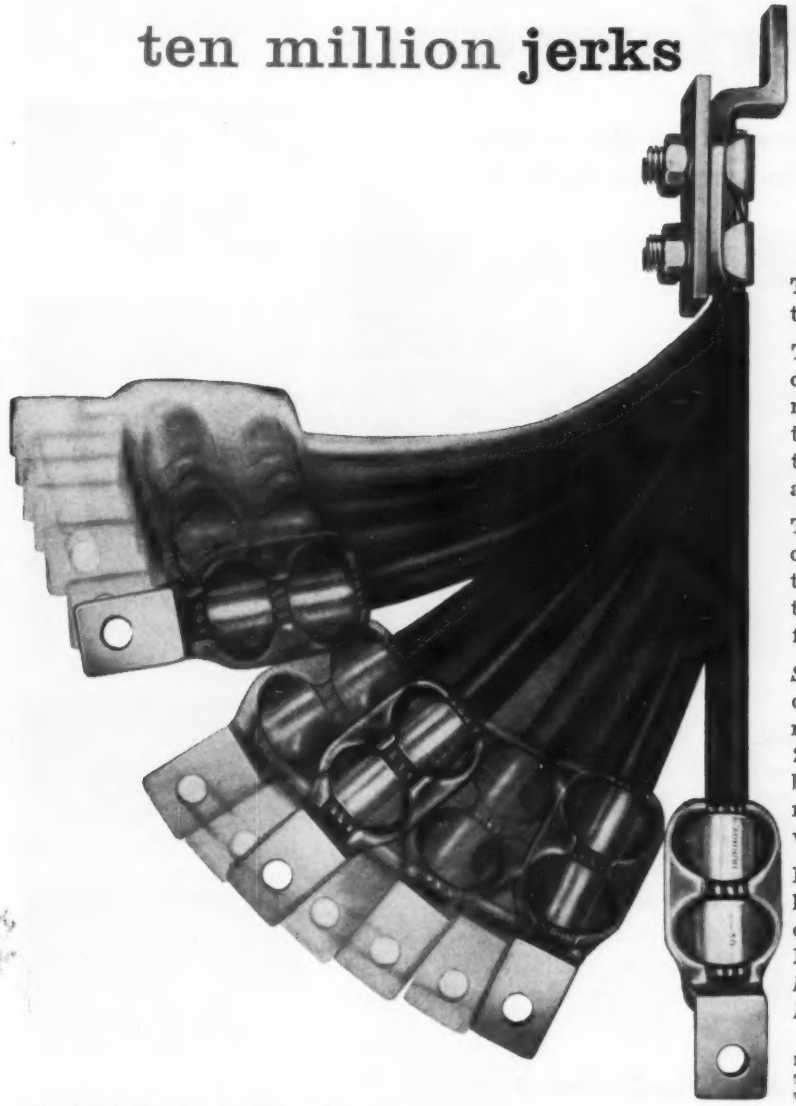
The problem was simple—but the solution was ingenious.

To dry and sift clay in a single operation, a major Southern brick manufacturing company conceived the idea of passing current through the sifting screen itself—making it a giant resistance-heated sieve.

The electrical problem was connections that could withstand the 70 jerks each minute between the vibrating screen and the fixed bus bar.

Solution: Sturdy VVA clamp connectors providing tight, reliable, re-usable connections carrying 2,500 amperes at 45 volts between bus bar and strap. Their service record on this job: 5 years without a single failure!

Better electrical connections can help speed your production, improve quality, cut costs. Call on Burndy—Norwalk, Connect., Toronto, Canada. *Factories:* New York, Calif., Toronto. *Export:* Philips Export Company.



BURNDY VVA: V-BOLT TYPE, ENGINEERED TO HOLD TIGHT UNDER CONTINUOUS VIBRATION. RE-USABLE.

It's good business to connect with...

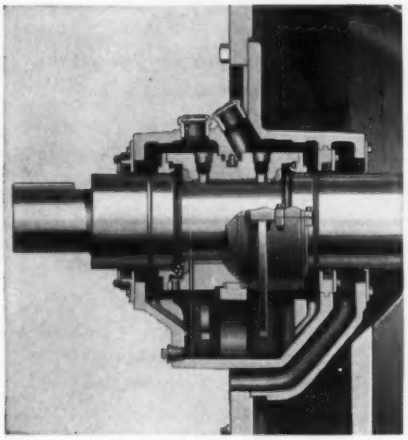
BURNDY

54-22

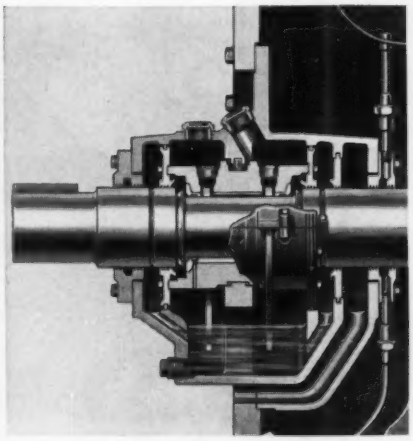
...FIRST name in electrical connectors; tools; methods

NEW Bearing Design Means Better Motor Performance

Allis-Chalmers capsule-type sleeve bearings now perfected for complete motor line



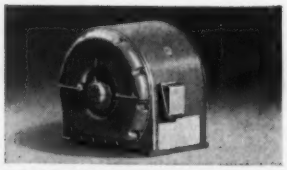
Standard capsule-type sleeve bearing



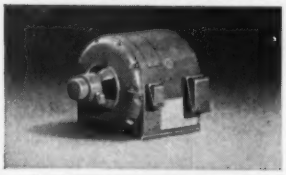
High speed capsule-type sleeve bearing

A new feature—an improved capsule-type bearing design—has been added to the Allis-Chalmers complete line of large end-shield bearing motors. This new bearing will give you better motor service, simplified maintenance and longer motor life through features like:

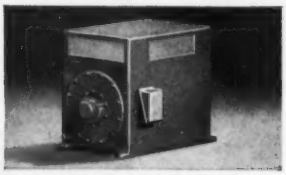
- Dust-tight, leakproof enclosure protects bearing from dirt, dust or abrasive materials.
- Venting system prevents oil leakage — keeps oil and vapor from getting into motor enclosure.
- Dual oil-rings insure bearing surface lubrication — either ring can adequately lubricate bearing.
- Split end-shield gives easy accessibility to winding and air gap — without disturbing capsule or bearing alignment.



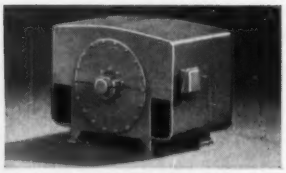
Drip-proof or splash-proof cage motor



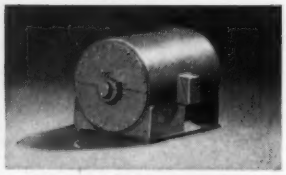
Synchronous or wound-rotor motor



High speed cage motor

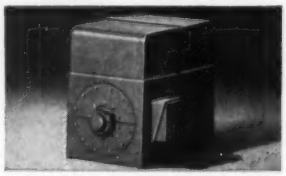


Weather-protected motor



Totally-enclosed fan-cooled motor

Totally-enclosed forced-ventilated motor



Water-cooled or inert-gas-filled motor

Capsule-type bearings are standard on these Allis-Chalmers motors.

You get MORE from Allis-Chalmers motors

More design and construction features — more application help. For complete information, contact your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

ALLIS-CHALMERS

A-5032

Phelps Dodge can make any Lead Sheath you specify!

No one type is best for all jobs!

Choosing the right lead sheath is strictly a matter of sizing up your specific job. No single type of sheath answers *all* the power cable needs of modern electric utilities.

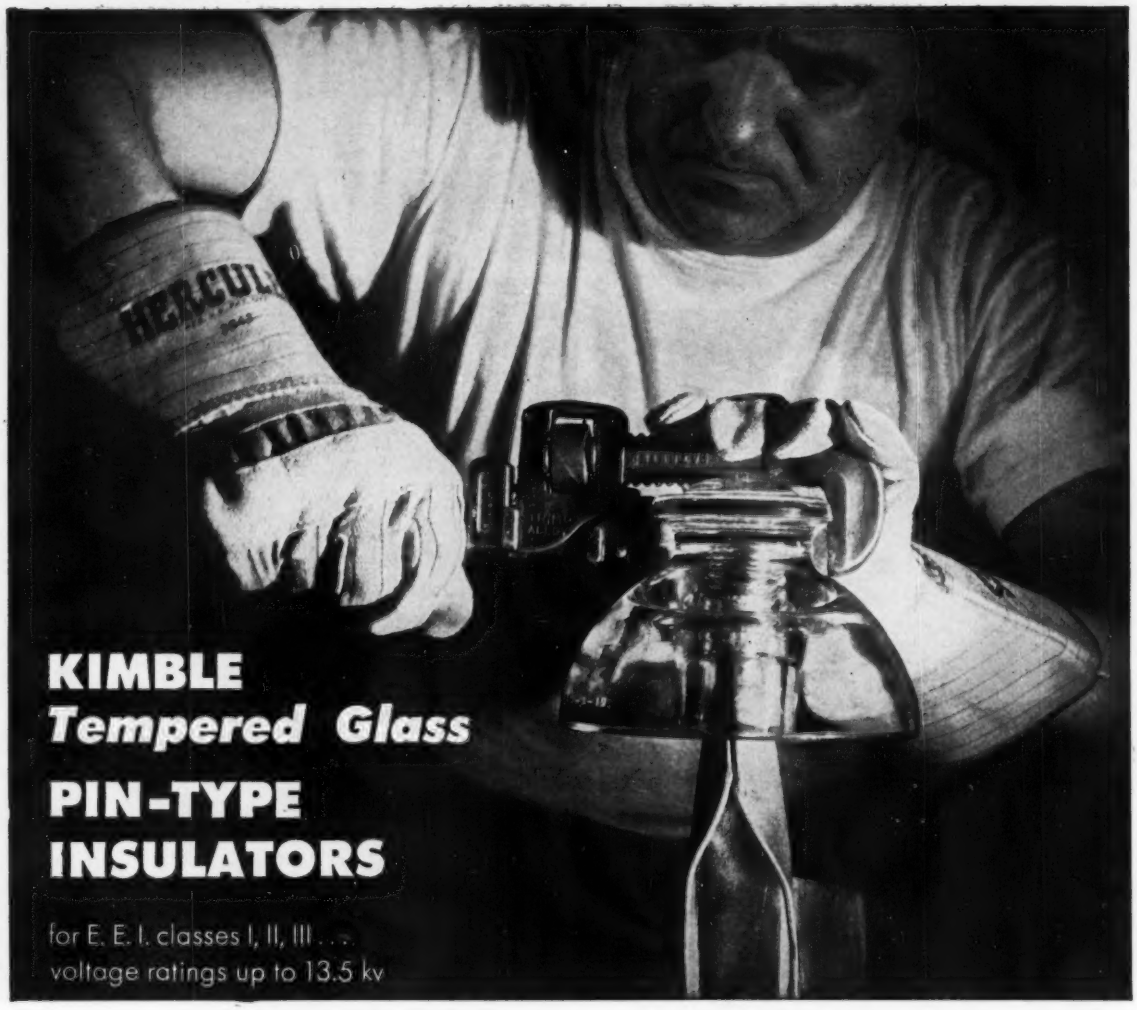
Phelps Dodge has a wide background of practical experience in developing, testing and manufacturing lead alloys for power cable sheaths. This covers the entire range of lead alloys, including copper bearing or common lead, Habirloy (arsenical) lead or tellurium alloy lead.

Phelps Dodge makes or can make any lead sheath you want. Next time you're looking for a sheath to fit a specific application, consult Phelps Dodge.

PHELPS DODGE COPPER PRODUCTS CORPORATION

40 WALL STREET, NEW YORK 5, N. Y.

Unusual 138-KV oil-filled cable designed for Commonwealth Edison Company of Chicago. One of many Phelps Dodge cable designs with a Habirloy (arsenical) lead sheath.



Stronger than the pin that supports it

SO STRONG . . . Torque test shows strength sufficient to strip threads on lead bushed pins and actually twist pole top steel pins.

This great strength saves installation time. It is not necessary to loosen Kimble tempered insulators for line-up with the conductor. Their strength will always allow another quarter-turn.

If it's on the pin, it's in service

In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

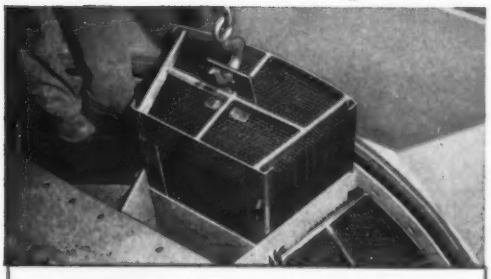
What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how tempered glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-5, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

air preheater installations are Ljungstrom®



Advantages of the Ljungstrom Air Preheater

- **Size for size, recovers more heat than any other type.**
- **Reduces fuel consumption. Permits use of lower-grade fuels. Increases boiler output and reliability.**
- **Eliminates cold spots...keeps corrosion to a minimum.**
- **Easier, faster to clean and maintain.**
- **Requires far less supporting steel and is quickly erected.**

MINIMUM CORROSION is an important reason. There are no cold spots in a Ljungstrom. Temperature is uniform on all heating surfaces—corrosion-causing condensation is reduced.

For all the facts, send now for a free copy of our 38-page manual.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

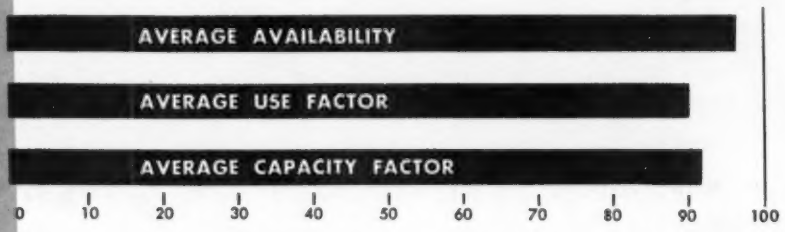
How much is

Operating Record of 99 C-E Reheat Boilers

There are 183 C-E Postwar Reheat Boilers in service, under construction or on order. These boilers represent an aggregate capacity of 22,273,000 kilowatts . . . an average of 122,000 kw per unit.

The first of these boilers was placed in service in September, 1949. By the end of 1955, ninety-nine units were "on the line." The combined service of these 99 units represents a period equivalent to 224 boiler years. Significant data concerning them are summarized below.

Total Capacity — kw	10,932,000
Average Capacity per Unit — kw	110,000
Total Boiler Time — hours	1,974,640
Total Boiler Time — years	224



DISTRIBUTION OF TOTAL OUTAGE	PERCENT
Inspection	2.34%
Boiler • Superheater • Reheater Economizer • Air Heater • Desuperheater — Fuel Burning Equipment	0.96%
(Auxiliary Equipment) Valves • Fans • Soot Blowers • Miscellaneous	0.66%
Total	3.96%

availability worth?

Many of today's high-capacity, highly efficient generating units have a "worth value" reaching into many thousands of dollars for each day that they are unavailable for any reason.

The steady trend to higher unit capacities, pressures and temperatures has, of course, but one principal objective – higher efficiency . . . lower BTU rate per kilowatt-hour.

And it only pays off when the unit is "on the line"

That's no news to the utility industry but the highly satisfactory composite performance record of the 99 C-E postwar reheat units now in service . . . shown on the opposite page . . . has a very direct bearing on the subject.

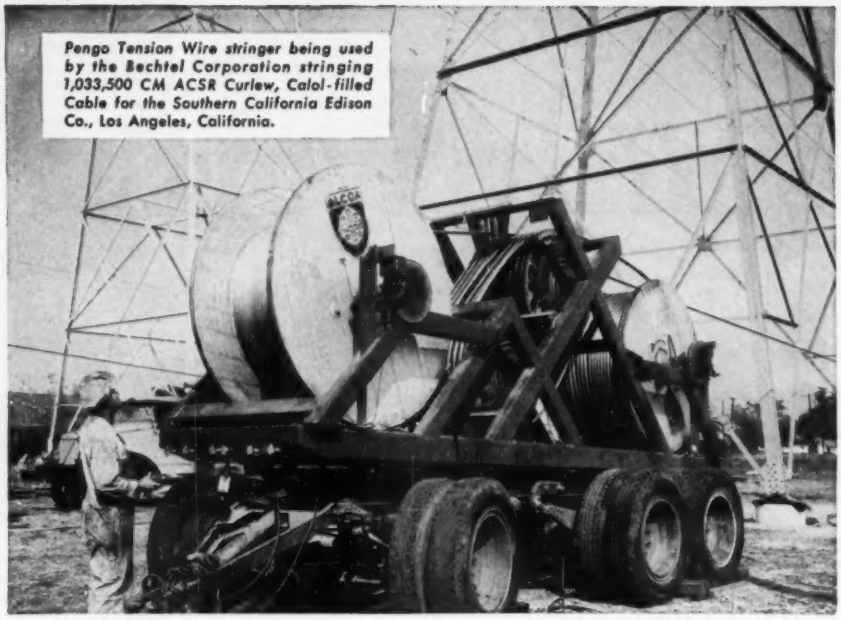
It adds up to this – the primary objective in the design and construction of C-E reheat boilers is to assure maximum lifetime availability. How well that objective is being achieved is defined by the record.

B-927

COMBUSTION ENGINEERING

Combustion Engineering Building,
200 Madison Avenue, New York 16, N. Y.

STEAM GENERATING UNITS • NUCLEAR REACTORS • PAPER MILL EQUIPMENT • PULVERIZERS • FLASH DRYING SYSTEMS
PRESSURE VESSELS • HOME HEATING AND COOLING UNITS • DOMESTIC WATER HEATERS • SOIL PIPE



Pengo Tension Wire stringer being used by the Bechtel Corporation stringing 1,033,500 CM ACSR Curlew, Calol-filled Cable for the Southern California Edison Co., Los Angeles, California.

The latest method of stringing conductors

- ***Safest, most economical for transmission, distribution and even secondary lines.***
- ***Its greatest savings are effected when stringing over and through energized circuits... by far the safest, too!***

Operation of the PENGO Tension Wire Stringer is almost unbelievably smooth. Because the tensioning is done on the Neoprene-Lined Bullwheels rather than on reels, conductor damage from the reels has been eliminated entirely. Due to the Neoprene lining of the Bullwheels, it is possible to use a full range of wire sizes to maximum groove capacity, which, in the case of the Model 6000-WS shown in picture, is Pheasant or 1⅜" diameter.

SMOOTH, POSITIVE CONTROL OF CONDUCTOR TENSION can be maintained at all times regardless of model or size of PENGO Tension Wire Stringer used. The large, specially designed PENGO disc brakes are mounted away from the Bullwheels to assure dissipation of the heat generated by the continuous braking action and prevent transmission of the heat to the Bullwheels.

In addition to the model shown in the picture, all series are available in low-slung trailer mounts for mountain work with separate easy-loading reel trailers.

List your requirements and send for descriptive literature and prices.

PETERSEN ENGINEERING CO.
Santa Clara, California Dept. 4
Please send me more information on the new Pengo Tension Wire Stringer.
Name_____
Firm_____
Address_____
City_____ State_____

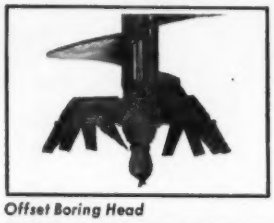
Made by the makers of the World-Famous
PENGO EARTH AUGERS

PETERSEN
ENGINEERING COMPANY
Santa Clara, Calif.

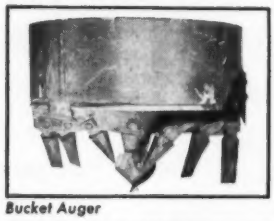
Other PENGO Products include:

24 inch Heavy Duty Flight Auger

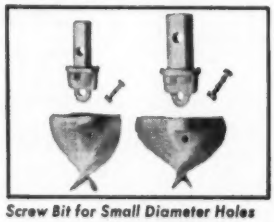
Double-Helix Heavy Duty Auger



Offset Boring Head

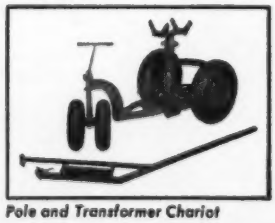


Bucket Auger



Screw Bit for Small Diameter Holes

Pulling Eye



Pole and Transformer Chariot

NEW

No. 53-XPJ Nicopress Tool with *Three Grooves*

Accommodates Nicopress Sleeves

FOR COPPER
1 solid, 1 seven strand, 2 solid, 2 seven strand, 2 three strand, 3 solid, 4 solid, 4 seven strand, 4 three strand, 6 solid, 6 seven strand, 8 solid, 8 seven strand, 3 No. 10, 3 No. 8.

FOR COPPERWELD
4A, 6A, 8A, 6C, 8C, 6D, 8D, 9½D, 3 No. 10, 3 No. 12, 4 solid, 6 solid, 8 solid, 10 solid.

FOR ALL-ALUMINUM
2 solid, 2 seven strand, 4 solid, 4 seven strand, 6 solid, 6 seven strand, 8 solid.

FOR AMERDUCTOR
8SCP or SCG, 10SCP or SCG, 12SCP or SCG.

Write for descriptive folder.

Nicopress Sleeves and Tools Patented in U. S. and Foreign Countries. "Nicopress" Registered in U. S. and foreign countries.

The National Telephone Supply Company

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

Canadian Mfr.: N. SLATER CO., LTD., HAMILTON, ONTARIO, CANADA

Export Distributor: INTERNATIONAL STANDARD ELECTRIC CORP., NEW YORK, N. Y.

THE NATIONAL TELEPHONE SUPPLY COMPANY

Lapp Builds the

. . . to give extra years of operating

Shipments today of Lapp Line Posts are at an all-time high. Most of them are going to companies which bought their first Lapp Line Posts fifteen, twenty, even twenty-five years ago. On the record, the performance of these earliest Lapp Posts (and all since)—has never been approached by any other line insulator. There are good reasons for such a record—the original idea of a Post as an insulator designed to take advantage of the *strength* of porcelain (rather than to impose on its weakness)—and *the way Lapp builds* the Post, which assures in service every promise in theory ever made for it.

Lapp Insulator Co., Inc., Le Roy, New York.

NO CONDUCTIVE GLAZE • Lapp Line Post *by design* is free of radio and TV interference. No corona is formed at operating voltages, so no "treatment" is required.

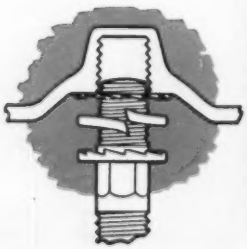
ONE PIECE PORCELAIN BODY • Porcelain is ten to twenty times as strong in compression as it is in tension. Lapp Post design eliminates nested porcelain parts, pins or other inserts, avoids internal strains. Stiffest under deflection.

FOG-TYPE LEAKAGE CORRUGATIONS • Multiple petticoats provide extra leakage distance and uniform leakage path; spaced for natural cleaning—wind and rain flush off contamination, keep surface resistance high.

SMALL DIAMETER • Lapp Line Post gets its flashover and leakage values from height rather than spread; easy for use with hot line tools.

SHORT, STURDY PETTICOATS • Maximum protection for insulator body under impact and flashover.

HARDWARE EXTERNALLY ATTACHED • Bases (and caps on Clamp-top Lapp Line Posts) are cemented ON. Porcelain is loaded only in a large-area low intensity compression grip.



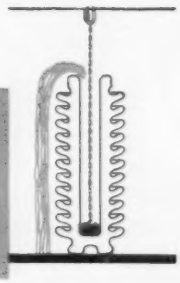
INTERCHANGEABLE STUD BOLTS • Easier stock inventory—separable long or short studs may be installed in the field. A positive lock washer, cooperating with serrated surfaces in insulator base and stud, permits easy removal, but locks stud against line vibration.

Line Post

security

LARGE CONDUCTOR GROOVE • Square-side top grooves meet new EEI-NEMA standards—provide for conductors of diameters up to 1½".

EASY TYING • Conductor groove, side groove and lip designed for fast, secure tie-wire attachment.

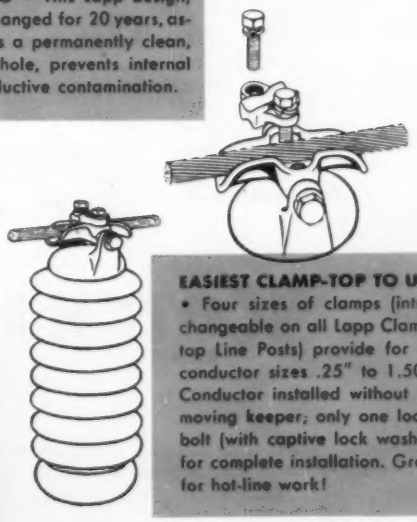


SOUND PORCELAIN • 100% electrical test before plugging or assembly—3-minute 60 cycle flashover from chain dropped entire depth of hole in inverted porcelain—assures soundness of head, soundness of whole porcelain.

INSIDE GLAZED • All Lapp Post porcelains are glazed inside and out—an extra-quality feature that makes for added cleanliness and more critical visual inspection.

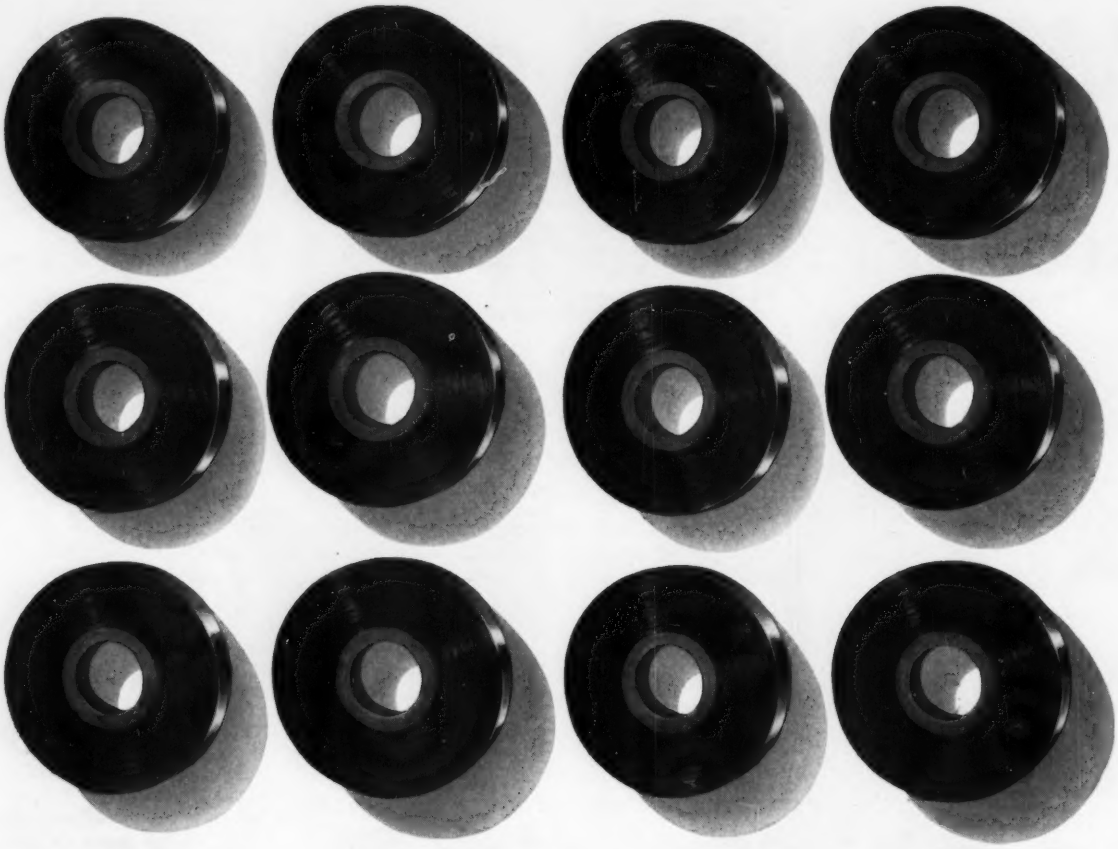
LIVE TERMINALS are separated by full length of the insulator. Loss of one or more petticoats does not reduce flashover distance.

PORCELAIN and RUBBER PLUG • This Lapp design, unchanged for 20 years, assures a permanently clean, dry hole, prevents internal conductive contamination.



EASIEST CLAMP-TOP TO USE • Four sizes of clamps (interchangeable on all Lapp Clamp-top Line Posts) provide for all conductor sizes .25" to 1.50". Conductor installed without removing keeper; only one loose bolt (with captive lock washer) for complete installation. Great for hot-line work!

Lapp



Can you spot a bad roll?

You'd need a pretty sharp eye. Slight variations in tape caliper or in dielectric strength are, like hundreds of other tape properties, pretty hard to see, or to feel.

Yet these tape properties are important — *vitally* important to safe, well insulated wiring — on bus bars, conduit, fittings.

On "SCOTCH" 33, we turn the job over to scientists — to machines and super-sensitive instruments. They perform hundreds of rigid quality-control tests. They make certain that the first plastic electrical tape on the market (and its heavy-duty cousins: "SCOTCH" 21, 22) is still the finest. And they make certain the quality *holds*.

That's why more public utility engineers specify "SCOTCH" 33 than any other plastic tape. They know their men like it — like the way it handles, the way it performs. They know, too, it's the safest way to get exactly* what they want — every time!

**Specifications for "SCOTCH" Brand No. 33 Plastic Electrical Tape: caliper — .007 inch; dielectric strength — 9,500 volts; adhesion (ounces per inch width) — 25; elongation at break — 175%; tensile strength (lbs. per inch width) — 25; More detailed information on request.*

PRODUCT OF 3M RESEARCH

REG. U.S. PAT. OFF.

SCOTCH BRAND No. 33 Electrical Tape

The term "SCOTCH" is a registered trademark of Minnesota Mining & Manufacturing Company, St. Paul 6, Minn. Export Sales Office: 99 Park Avenue, New York 16, N.Y. In Canada: P.O. Box 757, London, Ontario.

ANOTHER REASON WHY UTILITIES EXPECT MORE FROM

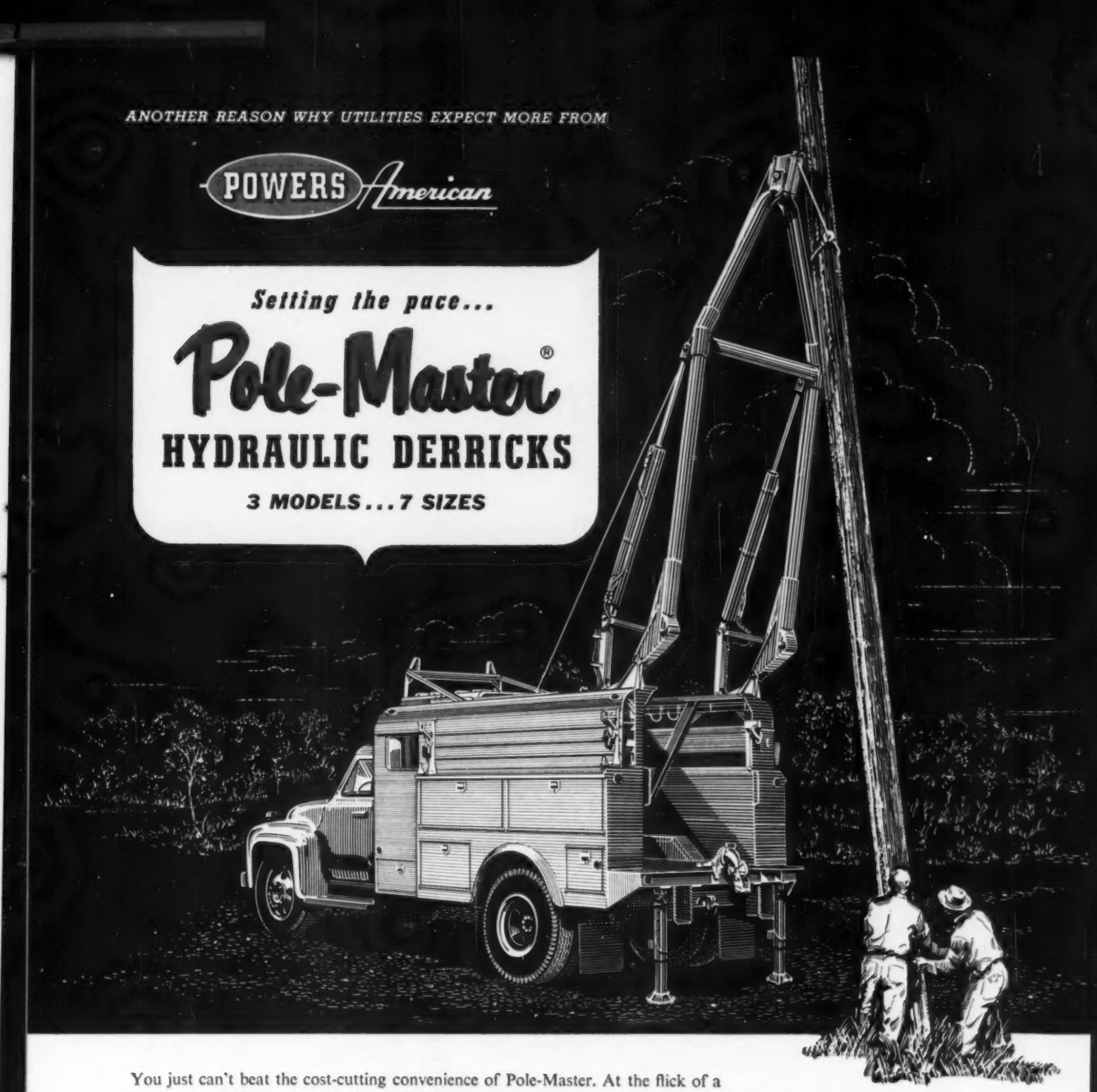
POWERS *American*

Setting the pace...

Pole-Master®

HYDRAULIC DERRICKS

3 MODELS... 7 SIZES



You just can't beat the cost-cutting convenience of Pole-Master. At the flick of a lever, powerful hydraulic cylinders move the derrick to the position that's *exactly* right for the hoisting job. There's no exposed mechanism. Head sheave can be threaded from the ground.

When it comes to capacity, Pole-Master equals or surpasses conventional derricks of comparable rating. It stows *above* the body... never obstructs valuable cargo area space.

Aren't these the features you've long wanted in a derrick for your job?

The powerful Series PM-2 Pole-Master, shown above on a Powers-American Series 800-C Line Body, is available in sizes for handling 40′, 55′, and 70′ poles.

DESCRIPTIVE LITERATURE ...plus complete price information IS YOURS FOR THE ASKING!

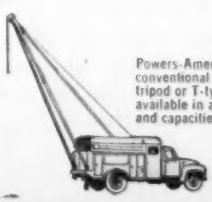
McCABE-POWERS AUTO BODY COMPANY

5900 NO. BROADWAY • ST. LOUIS 15, MO.

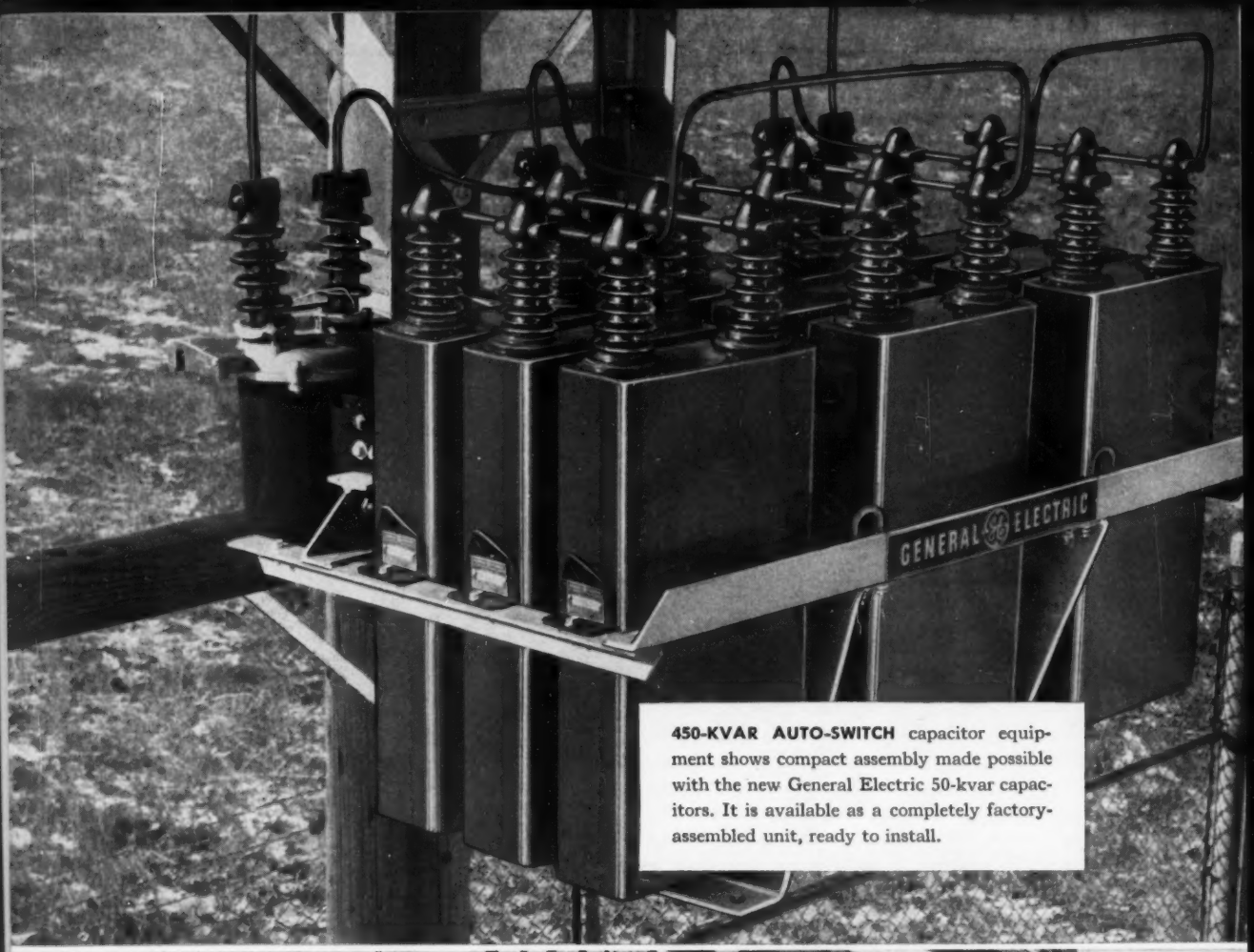
625 CEDAR ST. • BERKELEY 10, CALIF.

Series HD-2 Pole-Master Derricks can be furnished in sizes for handling 40′ and 55′ poles.

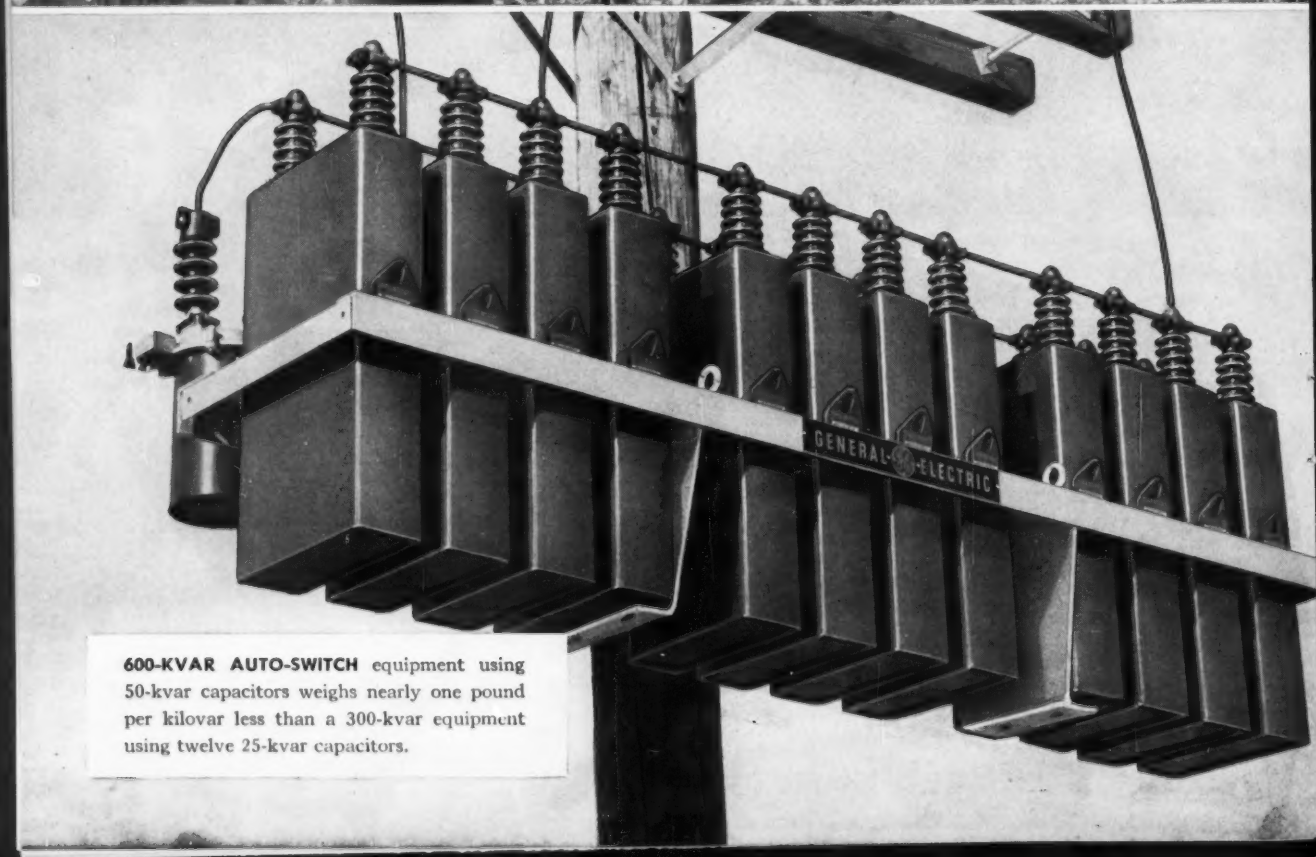
The Series HD-4 Pole-Master, actuated by four hydraulic cylinders, handles 55′ and 70′ poles.



Powers-American conventional derricks, tripod or T-type, are available in all sizes and capacities.



450-KVAR AUTO-SWITCH capacitor equipment shows compact assembly made possible with the new General Electric 50-kvar capacitors. It is available as a completely factory-assembled unit, ready to install.



600-KVAR AUTO-SWITCH equipment using 50-kvar capacitors weighs nearly one pound per kilovar less than a 300-kvar equipment using twelve 25-kvar capacitors.

New G-E 50-kvar Capacitors Double Auto-switch Capacity

Higher rated units mean lower costs, less weight and bending moment, lower switching cost, per installed kilovar

General Electric's new 50-kvar capacitors, designed so that they have the same mounting dimensions as existing 25-kvar units, now enable you to put MORE kilovars on the pole with sizeable savings in space, weight, and cost per kvar.

More compact equipments made possible with these new capacitors can give you double the kilovars formerly available in 25-kvar capacitor equipments with little or no increase in rack dimensions. Racks are factory assembled, and are available in ratings from 2400 to 13,800 volts.

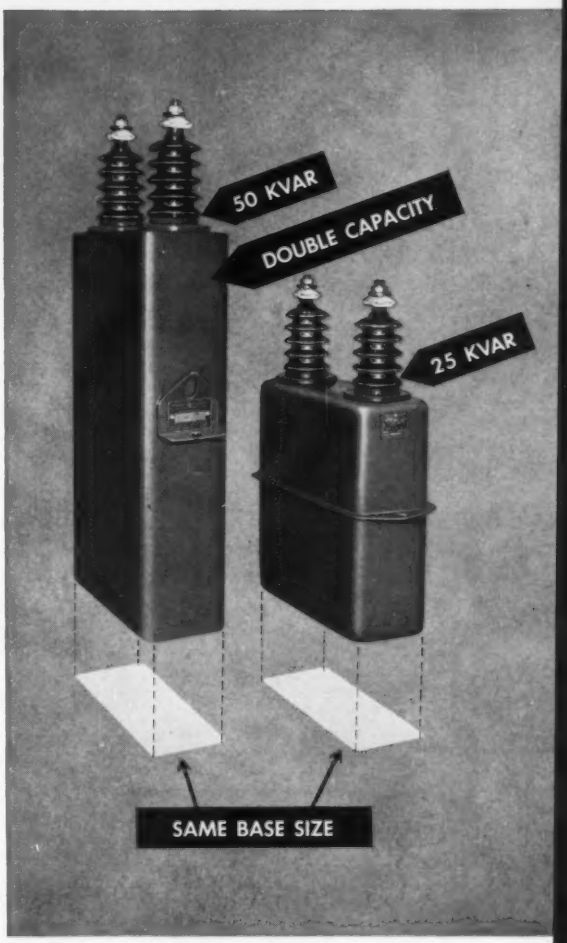
Reduced weight per kvar is made possible because one 50-kvar capacitor weighs approximately 15% less than two 25-kvar units. This results in even further weight savings in complete auto-switch equipments. For example, a single row auto-switch made up of twelve 25-kvar units weighs about 1110 lbs or 3.7 lbs per installed kvar. Use of 50-kvar units in the same arrangement gives you a pole-mounted equipment of only 2.8 lbs per installed kvar.

This 25% savings in weight per installed kvar is doubly significant. It means that bending moment on poles, an important consideration today, may be notably reduced per installed kvar by the use of 50-kvar capacitors in pole-mounted equipments.

Low kilovar costs also result from the use of 50-kvar capacitors. One 50-kvar unit costs 10% less than two 25-kvar capacitors. And, in switched equipments, switching cost can be reduced as much as 13% since a 600-kvar auto-switch requires no more switches than a 300-kvar equipment.

New features, too, have been built into the 50-kvar capacitor auto-switch designs. New neoprene switch terminal boots require no taping. Self grounding washer-head mounting screws eliminate loose parts, and provide permanent unit case grounding.

Orders are now being accepted for the new, higher rated auto-switches. The new bulletin, GEA-6485, contains full information on the 50-kvar capacitor equipments. Just contact your G-E Apparatus Sales Representative, or write to the General Electric Company, Section 441-34, Schenectady 5, New York.



NEW G-E 50-KVAR CAPACITOR has been designed so that it will be interchangeable with existing 25-kvar units having standard NEMA mounting dimensions. Doubled capacity is achieved with an increase of only eleven inches in height over the 25-kvar G-E unit. It is available in both 5- and 8.7-kv classes.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Transportation. The 4-Wheel-Drive 'Jeep' Truck's go-anywhere ability takes crews and equipment to meet service emergencies, over good roads or no roads, in good or bad weather—along the right-of-way or to off-road structures where other vehicles can't go.

Only 4-Wheel-Drive 'Jeep' Vehicles meet every service emergency!

Trenching. The 'Jeep'-propelled trencher digs up to 800 feet of clean-cut trench per hour, to speed the installation of cable, conduit and service lines. Travels safely on the highway at top legal speeds between jobs.

Maintenance. With the extra traction of its 4-wheel drive, the versatile Universal 'Jeep' gets through to trouble spots, on the road or off, with sure dependability. It helps speed installations, keeps service and maintenance schedules up-to-date.

Whether carrying an underground detail with cable splicing equipment or helping work crews string high wire, 'Jeep' vehicles work 'round-the-clock in electrical industry service.

Time-tested, performance-proved go-anywhere 'Jeep' transportation virtually assures uninterrupted customer service. In emergencies, the extra traction of 4-Wheel-Drive 'Jeep' Vehicles carries men, tools and equipment through mud, sand, soft earth or up steep grades—in heavy rain, snow or other emergencies of weather—to reach tower, substation, service lines or wherever repairs are needed. On the highway, 'Jeep' vehicles travel in conventional 2-wheel drive at top legal speeds.

For hundreds of different jobs, from installing meters to patrolling the right-of-way, rugged 'Jeep' vehicles serve the electrical industry. Ask your Willys dealer for a practical on-the-job demonstration today, or write for information.

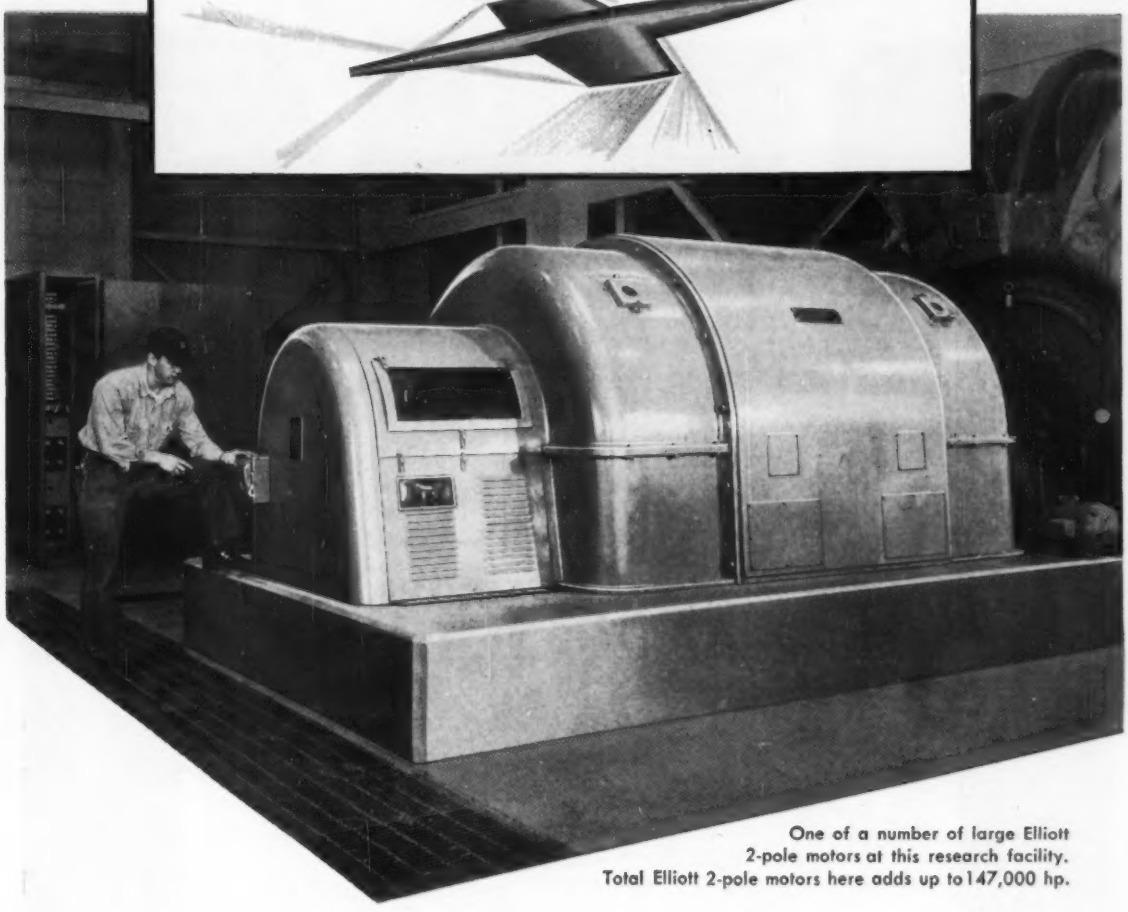
The 'Jeep'®

family of 4-Wheel-Drive Vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

MOTORS DESIGNED FOR AERODYNAMIC RESEARCH



One of a number of large Elliott 2-pole motors at this research facility. Total Elliott 2-pole motors here adds up to 147,000 hp.

Large ELLIOTT 2-pole synchronous motors drive compressors and exhausters in large eastern aviation research facility

Elliott motors get assignments where both reliability and special design features count. This 16,500-hp, 3600-rpm synchronous motor is one of ten operating at this research facility, furnished with such features as high-pressure oil lift on bearings and an enclosed ventilation system. Elliott engineers "fitted" these motors to the starting and operating characteristics of the centrifugal compressors. They also designed and built the variable-frequency motor-generator sets which furnish starting power for these motors. Consult Elliott district offices on your motor requirements or write to the Elliott Company, Ridgway Division, Ridgway, Pa.

RG-1

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS • CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

More efficient connections all three ways...

BRAZED

CLAMP TYPE

BOLTED

Because it's SQUARE!

CHASE® VENTILATED SQUARE COPPER TUBE BUS CONDUCTOR!

Power gets a green light, even through the joints of Chase square copper tube bus! Those four flat sides have more than enough surface area for brazed, bolted or clamped connections to take a tight, highly conductive grip. Such firm and secure joints have high mechanical strength, too—withstand the distorting forces of heavy short-circuit current almost as well as beam-rigid Chase square tube bus itself! Add the increased current-carrying capacity of *cooler-performing*, ventilated Chase square tube conductor, and you have electrical main arteries second to none in performance!

Write for *free* Chase Bus Conductor Brochure *today!*

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

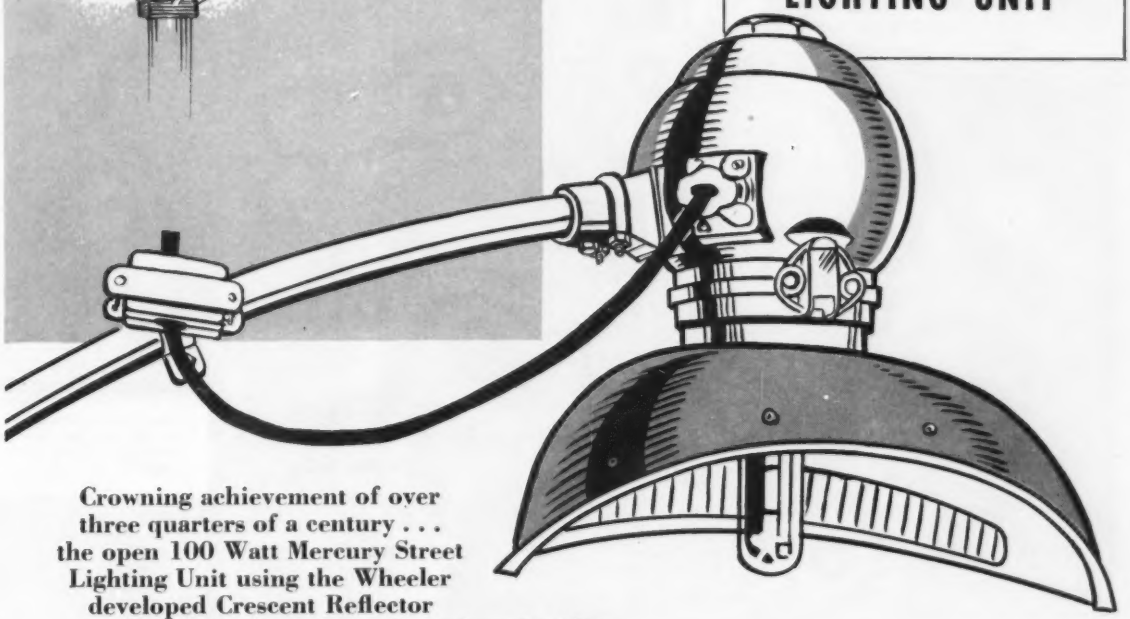
The Nation's Headquarters for Brass & Copper

Atlanta	Chicago	Denver	Indianapolis	Minneapolis	Philadelphia
Baltimore	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh
Boston	Cleveland	Grand Rapids	Los Angeles	New Orleans	Providence
Charlotte	Dallas	Houston	Milwaukee	New York	Rochester
	St. Louis	San Francisco	Seattle	Waterbury	

For 75 years...
...Street Lighting for a safer America!

from the original Wheeler mirrored Oil Lamp to the modern

100 WATT
MERCURY STREET LIGHTING UNIT

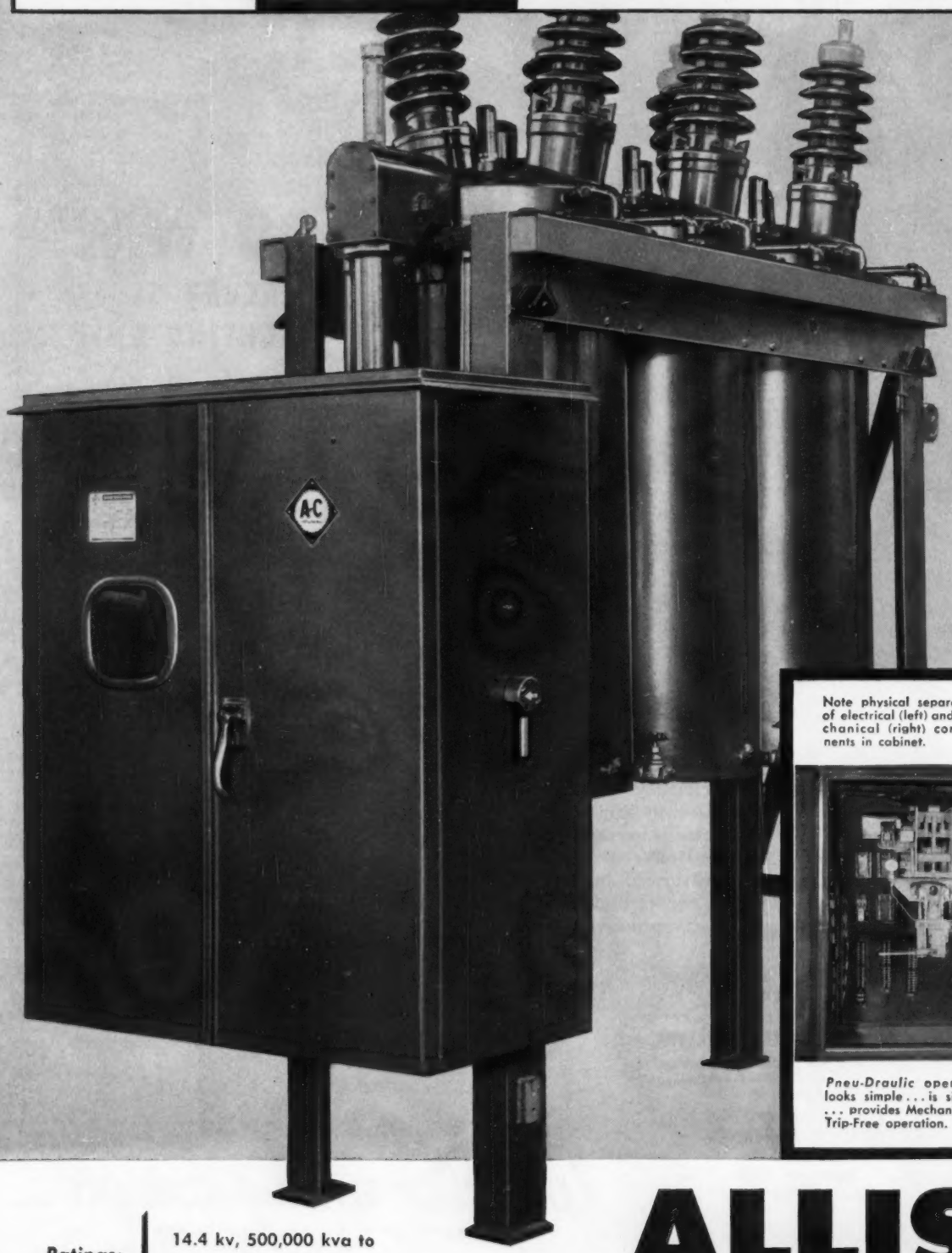


Crowning achievement of over three quarters of a century . . . the open 100 Watt Mercury Street Lighting Unit using the Wheeler developed Crescent Reflector . . . illustrating the advanced engineering that has made Wheeler Street Lighting first choice in modern, progressive communities everywhere.

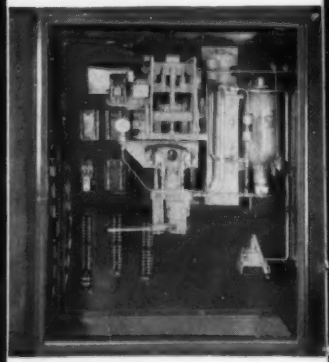
Wheeler
congratulates the
ILLUMINATING ENGINEERING SOCIETY
on its 50th Year Golden Anniversary
and welcomes all lighting people
throughout the world to the
50TH ANNUAL NATIONAL TECHNICAL CONFERENCE
of the I. E. S.
September, 1956
Boston, Massachusetts

Wheeler REFLECTOR COMPANY
275 Congress Street, Boston, Massachusetts

You get MORE when it's Built by



Note physical separation of electrical (left) and mechanical (right) components in cabinet.



Pneu-Draulic operator looks simple . . . is simple . . . provides Mechanically Trip-Free operation.

Ratings: 14.4 kv, 500,000 kva to 69 kv, 3,500,000 kva

ALLIS-

ALLIS-CHALMERS

NEW

frame-type Allis-Chalmers

BREAKER

Completely Redesigned from Top to Bottom for MORE Accessibility

Here are some of the many features of this new breaker:

- Low maintenance, due to:
  a) Simplified external adjustment of overtravel stop . . . no feeler gauges required.
  b) Single lift rod guide (in place of two) for greater accessibility to pole unit mechanism.
  c) Only four bolts hold tank to frame . . . simplifies lowering.
  d) Cabinet built shallow for easy access.
- No tank liner required.
- High efficiency oil-gas separator.
- AEIC standard wiring *plus* ASA standardized bushings.
- 100% Mechanically Trip-Free — like all Allis-Chalmers breakers.
- Available with *Pneu-Draulic*, pneumatic or solenoid operator.

For the rest of the story, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

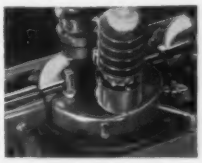
A-5011

Ball-type position indicator on top of breaker visible from 360 degrees.

Side trip provides accessibility — *plus* provision for padlocking.

Sampling oil is drawn from the working area of breaker tank.

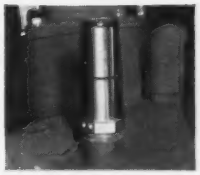
Smooth fabricated steel top for each tank — free from crevices or ridges.



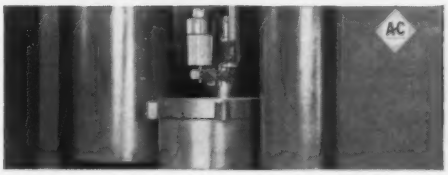
Operator cabinet is low to foundation level for easy access to interior.

CT lead ducts eliminate conduit—have removable bottom plates for full-length access.

Turbo Ruptor device has threaded pot for easy removal . . . self-aligning tulip and bayonet contacts.



Float-type oil gauge provides more visibility . . . eliminates leakage of sight type gauge.



Access to tanks and contacts is unobstructed by frame. Note full tank skirt for stability when lowered.

Pneu-Draulic and *Turbo Ruptor* are Allis-Chalmers trademarks.

CHALMERS

A-C ALLIS-CHALMERS

Public Service Co. of Indiana, Inc. communicates by G-E 2-way radio

Radio covers its entire system

All three operational divisions of the Public Service Company of Indiana depend upon General Electric 2-way radio to help coordinate the state's supply of vital electricity.

The all-duplex installation operates on the 25-50 mc band. District offices and generating plants maintain radio contact with service trucks and repair crews. Thanks in part to radio control, a continuous supply of electricity is generated and delivered to homes, municipalities, business and industry in 70 of the state's 90 counties.

Fourth year of service

For nearly 4 years, the G-E system has provided efficient radio service from 37 independent base stations. These coordinate the activities of more than 250 G-E equipped mobile units on 24-hour duty throughout the state.

2-WAY MOBILE RADIO

General Electric's new Progress Line of 2-way radio is available now to help your utility operations. Call in your G-E Communications Counselor, or write: *General Electric Co., Communication Equipment, Section X-1956-14. Electronics Park, Syracuse, New York.*

Progress Is Our Most Important Product

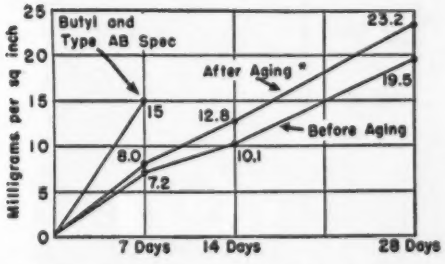
GENERAL ELECTRIC

Amazing moisture resistance of Anaconda's Type AB butyl high-voltage insulation helps reduce failure due to moisture.

When you can't keep cable out of moisture

New insulation keeps moisture out of cable

Exceptional moisture resistance is provided by Anaconda Type AB butyl insulation.



RESULTS OF mechanical moisture absorption test show Type AB retains good moisture resistance even after aging.

Where rubber-type cable is installed in underground ducts or buried directly in the earth, the moisture-resistance properties of the *insulation* are vitally important.

Latest facts show *Anaconda's Type AB butyl high-voltage insulation absorbs far less moisture* than industry standards permit. For the mechanical moisture absorption test, the industry has regarded 15 milligrams increase in weight per square inch of exposed surface, after 7 days' immersion at 70C, as a criterion for satisfactory moisture resistance. Type AB easily meets that requirement – in fact, typical results show it absorbs less than 7.2 mg. in 7 days.

New Engineering Bulletin EB-27 gives you full details on performance of Type AB insulation in 15 Industry Specification tests. Ask the Man from Anaconda for your copy. Or write: Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

Get all the facts on Anaconda butyl. Write today –

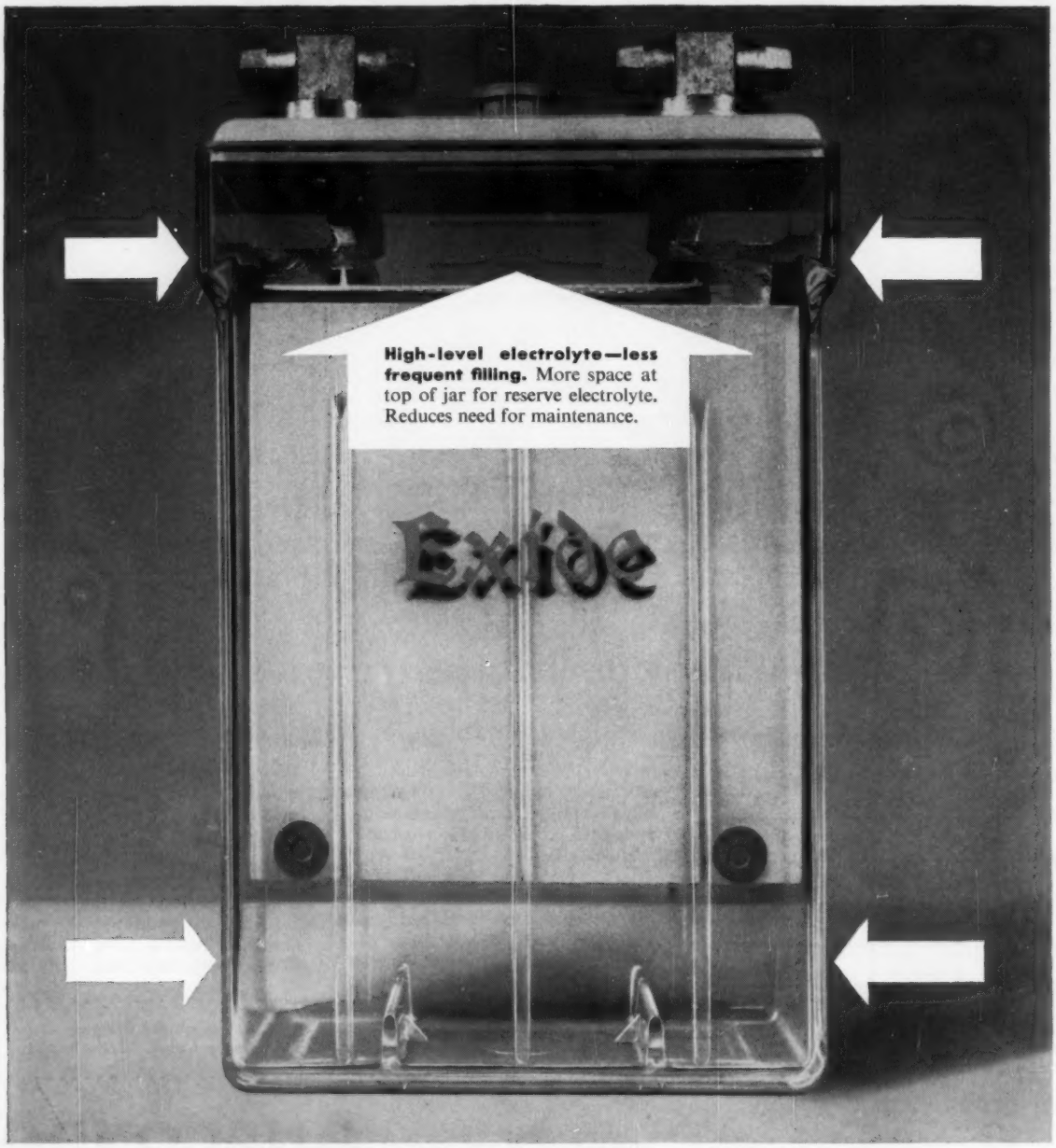
ASK THE MAN FROM ANACONDA®

–PIONEER IN BUTYL INSULATION

THE NEW EXIDE-

Design advances increase capacity,

Suspended plates. See those ledges molded into the jar walls. That's where the plates rest—suspended from the top instead of being supported on the bottom. Both positive and negative plates hang free in the electrolyte.


High-level electrolyte—less frequent filling. More space at top of jar for reserve electrolyte. Reduces need for maintenance.
Exide

Look at this huge electrolyte reservoir at the bottom of the jar. Even in the heaviest cycling service, sediment can never short the plates. Extra electrolyte maintains high specific gravity even when the charge is 'way down. This feature is especially advantageous in countless applications where batteries are exposed to low temperatures.

MANCHEX BATTERY

life potential, and range of uses

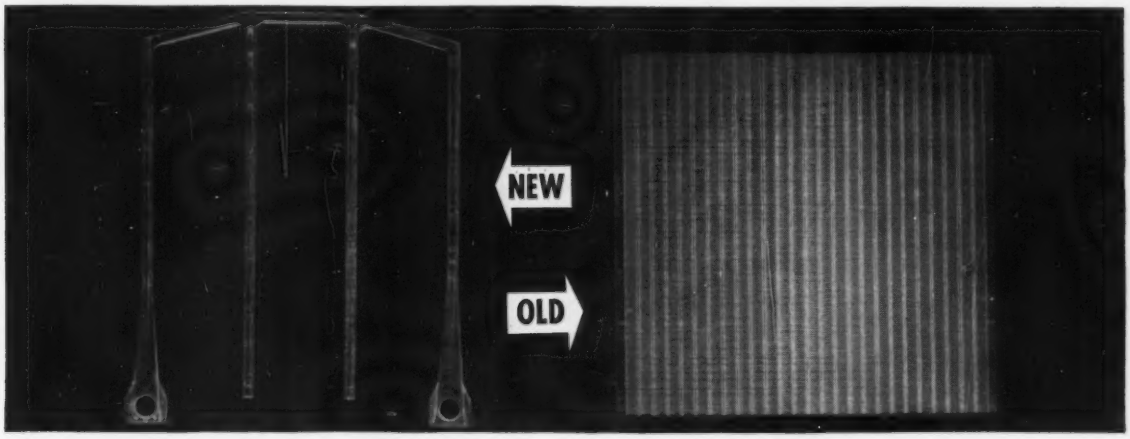
Trust Exide to make the world's most famous long-life battery even better.

In developing this completely new Exide-Manchex Battery, Exide engineers tackled the toughest battery problems that were yet to be solved. As a result, they not only improved the performance capabilities of the Manchex in floating service, but also qualified it for cycling service applications.

Here in one giant step forward, the Exide-Manchex Battery has moved years more ahead of every other battery in its field. Now it offers you even more value for your money, and even greater assurance of dependable performance all the years you use it.

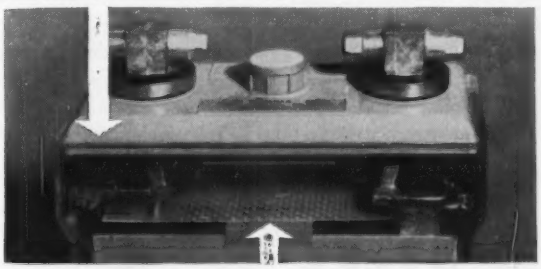
Be among the first to get complete information on this new Exide-Manchex Battery. Call your regional Exide representative. Or write Exide Industrial Division, The Electric Storage Battery Company, Philadelphia 2, Pa.

Exide®

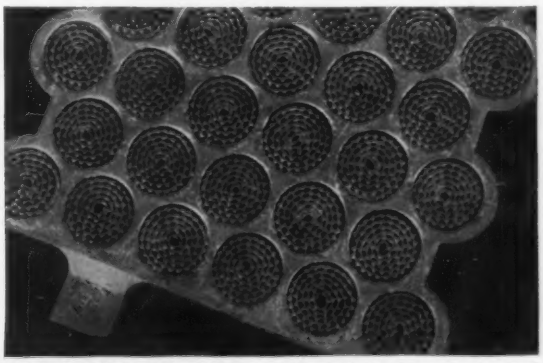


New open separator helps boost capacity. Sudden demands for battery power set positive plates to drinking up electrolyte in huge gulps—hard to do through dense separators. But this new open separator, combined with the high porosity microporous separator, gives every positive plate more elbow room. Electrolyte is free to flow to the plates more readily, more rapidly. Internal resistance of the battery is reduced. Battery capacity increased.

Improved plastic cover sealer. Special new sealer never dries out or cracks open. Welds cover to jar. Forms airtight, liquid-tight seal against leakage. Easily removed if necessary. Sealed-ring construction around posts prevents acid leakage.

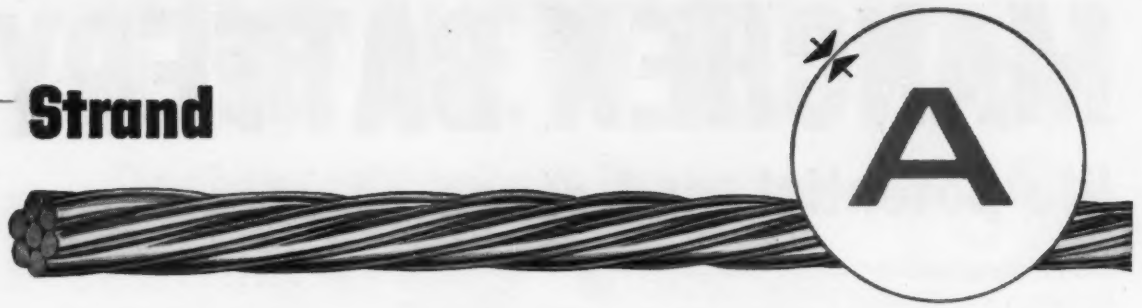


Protection for separators. New plastic screen protects separators from damage during maintenance and testing; protects against foreign materials dropped into cell.



Exclusive Exide-Manchex positive plate. Pure lead spiral buttons are held tightly in sturdy grid. Act like shelves for oxide. Huge reserve lead-supply in buttons maintains capacity and stretches battery life.

Strand



with the Coatings

for Various Field Conditions

The life of strand depends heavily upon the protective coating that encases each wire. Hence the matter of coating is one that deserves the closest study before an inch of strand is purchased.

Obviously, corrosive conditions are not the same in all areas. They differ widely. Bethlehem meets this situation by offering strand with *three* different coating weights. The lightest, called A, is the equivalent of extra-galvanized. Coating B is twice the thickness of A. Coating C, which offers the most protection, is triple the thickness of A.

Thus it is always possible to choose a coating that will meet the conditions of any given location. Naturally, all factors being equal, the B and C coatings will greatly outlast the A, although the A-weight does have its place.

What about quality? In all three weights the *quality* of the coating is the same. The difference is merely a matter of thickness. All Bethlehem strand is coated with the same high-purity zinc, applied electrolytically. This special method of application, called bethanizing, insures a jacket so uniform and ductile that it will not crack or peel, even under repeated bending.

When you are planning new line installations, we suggest that you consider bethanized strand. Our engineers will be glad to give you full details.

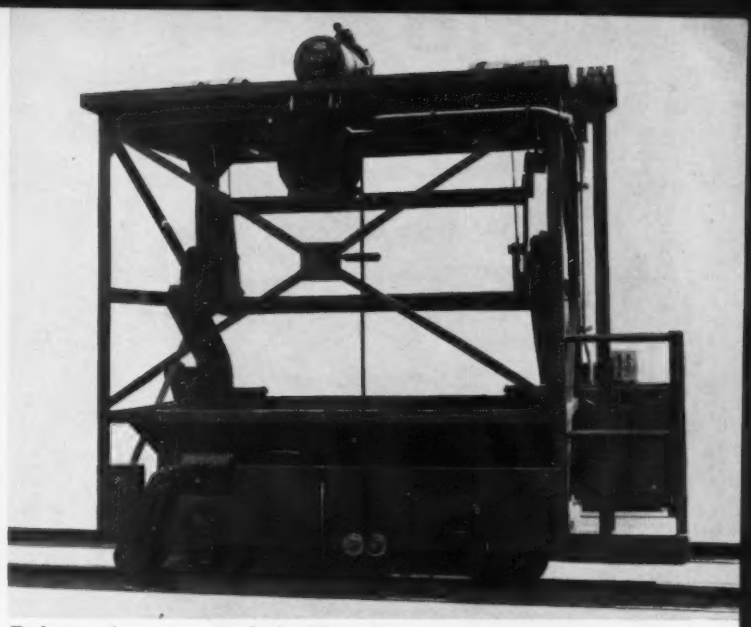
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

TRASH RAKE... PACECO STYLE



Rake carrier moves to desired location . . .

. . . Rake drops to desired depth . . . tilts to horizontal position to catch trash . . . raises, and dumps!

This Paceco designed trash rake is now giving efficient, effective service on dams. It is low in first cost and economical and fast in operation.

Paceco specializes in custom-built equipment for electric generating projects. We design and manufacture cranes, hoists, gates, penstocks and allied heavy equipment.

Some units we build direct from the buyer's plans. In many instances, however, Paceco engineers work with the buyer *at the designing stage*. Experience has proved this consultation may sharply lower initial cost, improve operational efficiency and reduce maintenance.

For over 30 years, many of the country's leading utilities have enjoyed Paceco's quality control, engineering skills and price economies — all under *one responsibility*. Your inquiry is requested for preliminary discussion or invitation to bid —

Send for Paceco's illustrated brochure, "Custom Designed Equipment for Hydro-Electric and Steam Power Plants and Water Works."

PACECO

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PACIFIC COAST ENGINEERING COMPANY, INC.
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150
50
250

Moving in soon . . .

New transformers to increase return on your distribution investment

The most talked about news in distribution equipment investments are the new lines of Westinghouse CSP* and conventional transformers. In the CSP transformer, operating range has been boosted as much as 20% . . . without sacrifice of service life. In the conventional Type S, this increased capability is also available. These are head-and-shoulders advantages over any other transformers available today.

Returns to you can be enormous. Greater, longer overloads mean drastic reduction in line emergency calls. Planned change-out schedules can be met more easily.

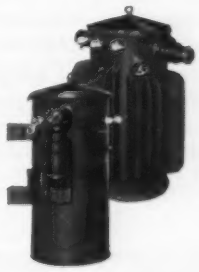
For the CSP transformer, this means trip-outs—way down. Add to this a 15% boost in breaker settings for maintaining service in emergencies and you have operational flexibility—way up.

Now, imagine a transformer that predicts its own life. The new thermal-duty indicator* in Westinghouse Type S conventional transformers does just that. A signal light shows *when* the unit is overloaded; the indicator dial records *how long*, cumulatively for the life of the equipment. Again—for orderly checkups, change-outs and peak efficiency, this transformer has "economical buy" written all over it.

The result of these exclusive new developments is assistance to you in more effective load management. To meet the vastly increased demand for these new transformers, plants at Sharon, Pa., and Sunnyvale, California, are working around the clock.

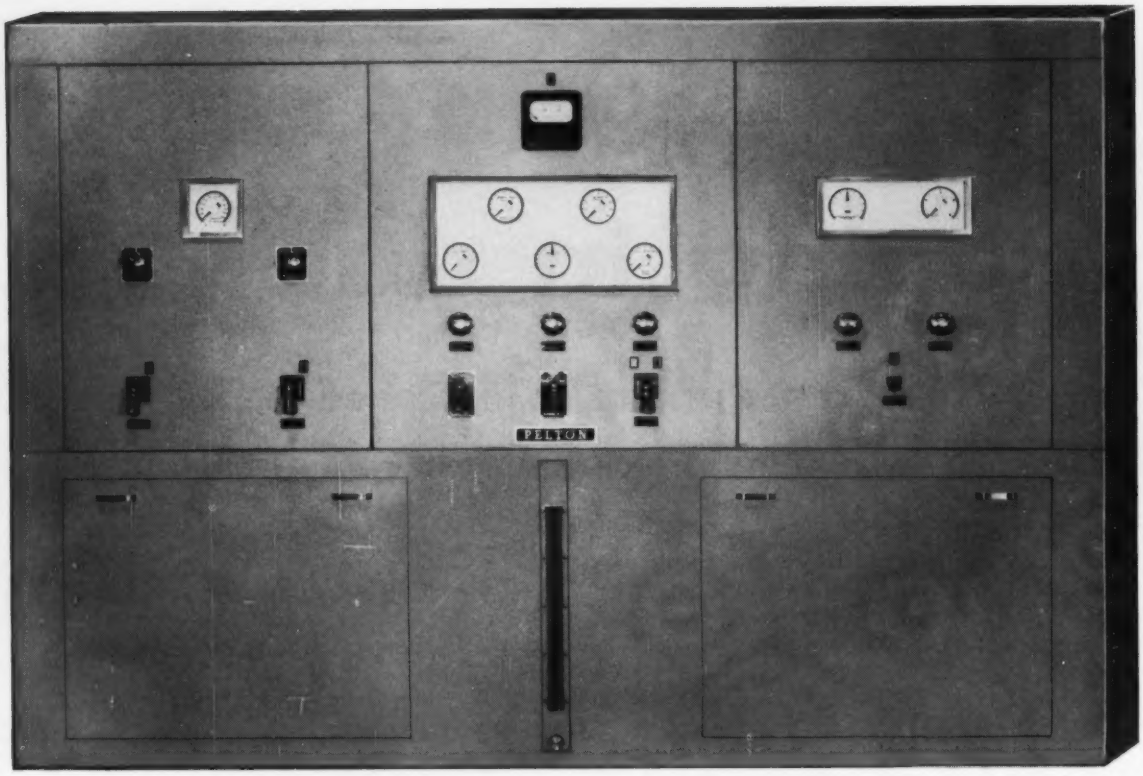
Get in touch with your Westinghouse sales engineer or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-70763

* Optional at slight additional cost.



WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU***



Designed for Nimbus Dam on the American River, California, this Pelton governor has a wicketgate capacity of 126,000 ft.-lbs. and a Kaplan blade capacity of 87,500 ft.-lbs.

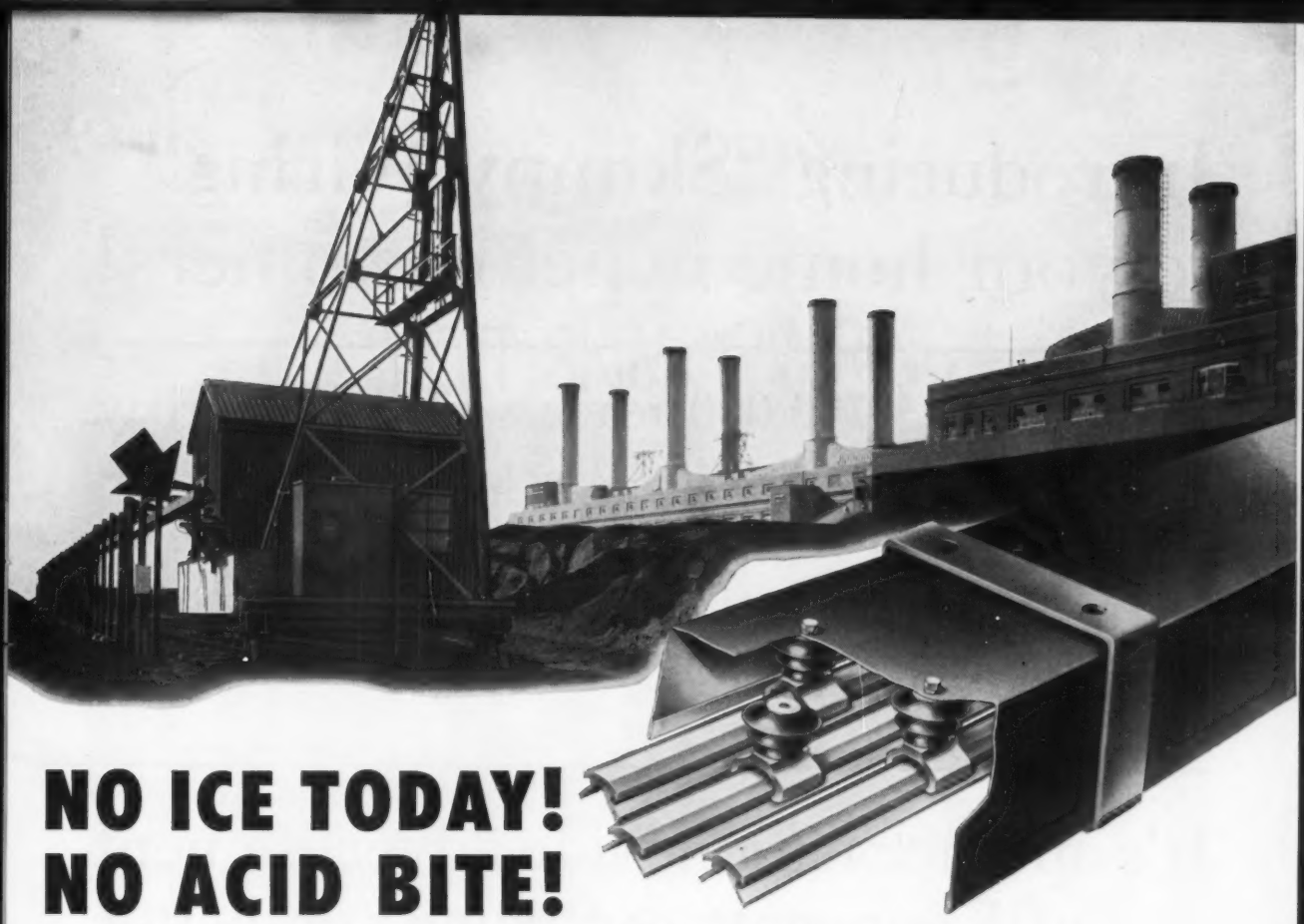
Pelton® governor for Nimbus power plant exceeds contract specifications

Prior to installation at Nimbus Dam, this Pelton governor was exhaustively tested under simulated power plant conditions. It was tested under load changes, frequency deviation and variations in speed droop. These notarized tests proved that sensitivity of the speed response element, and over-all governor characteristics will *more* than meet the job.

Pelton pre-tested performance is an integral part of every Pelton product. In addition to governors, BLH manufactures all four basic types of turbines, valves, pumps, surge suppressors and related equipment. For illustrated bulletins, write BLH Corporation, Philadelphia 42, Pennsylvania, or Dept. 5207, Pelton Division (BLH), 2929 Nineteenth Street, San Francisco 10, California.

PELTON DIVISION
BALDWIN-LIMA-HAMILTON

DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Hamilton • Lima • Loewy-Hydropress • Madsen • Pelton • Standard Steel Works



NO ICE TODAY!
NO ACID BITE!

Keystone Aluminum Conductor System Brings Trouble-Free Service To Buffalo Plant

NIAGARA MOHAWK POWER COMPANY has ended a second winter without a shutdown of these coal storage towers. Another trouble-free record for KEYSTONE Aluminum Conductor Systems.

Service conditions are severe in the lake city. This outdoor installation formerly had a big ice problem with the original wire system, but ice can't form on the enclosed KEYSTONE inverted-V conductors. Sulphuric acid fumes from the coal piles won't corrode KEYSTONE's Aluminum Conductors, hangers and joint plates.

The KEYSTONE Integrated Aluminum Conductor System has installation advantages too. Lightweight, compact, easy to erect—an ideal system for the enclosure requirements of these leading towers.

Are you building or modernizing a materials handling system? Then you'll be interested in systems of aluminum, copper or steel. We build them *all*. Our engineers will be glad to discuss the proper application for your requirements.

WRITE TODAY FOR CASE HISTORY BOOKLET ON ALUMINUM CONDUCTOR SYSTEM INSTALLATIONS.

KEYSTONE SAVES 3 WAYS

1. **LONGER LIFE** for conductors; aluminum lasts longer in destructive atmospheres. Longer shoe life; contact surfaces stay smoother, cleaner. Longer insulator life; less vibrating weight. No downtime from ice.
2. **LIGHTWEIGHT** aluminum permits pre-assembly of standard units; reduces installation costs and cost of insulators and supporting structures. Permits economical enclosures to safeguard personnel and operations.
3. **HIGH CURRENT CAPACITY**, low voltage drop. No need for boosters, multi-point feeds on long runways. Pre-engineered systems now operating up to 6,000 amp. capacity. Amperage possibilities unlimited.

ESM

ELECTRIC SERVICE MANUFACTURING CO.

PHILADELPHIA 32, PENNA.

Introducing "Skimpy Wiring" to your homeowner customers!

More than 15,793,000 readers of the Saturday Evening Post and This Week national magazines will see this dramatic Kennecott ad featuring "Skimpy Wiring"—Dead End Kid of the electrical business!

It's another nation-wide advertisement in the Kennecott campaign for better home wiring with copper—a drive that *helps you increase your sales of power!*

Let Kennecott help you with your own local better wiring campaign, too!

SEND FOR FREE PROMOTION MATERIAL

Send today for free reprints and poster-sized blow-ups of *Kennecott's* full-page national advertisements. Get free copies of the educational booklet, "The ABC of Home Wiring." Ask for complimentary home wiring Wall Chart, mat service folder and list of *at-cost* prices for large-quantity orders of all material available. No cost, no obligation! Just write: Kennecott Copper Corp., Dept. W 56, 161 East 42nd St., New York 17, N. Y.

MEET SKIMPY WIRING

The Electrical Delinquent found in 35,000,000 homes!

Look at that tangle of plugs and sockets! Note the frayed, weak-looking wiring! That's him, all right – Skimpy Wiring – the villain responsible for the electrical woes of homeowners all over the nation.

Have *you* a toaster that heats slowly? Does *your* TV set twitch when other appliances go on? Do *your* fuses blow or circuit breakers trip too often? If so, beware . . . you are a victim of Skimpy Wiring!

Weak, worn-out home wiring cannot possibly deliver full power to your appliances. It wastes electricity, can cause appliance failure, may even be a source of fire!

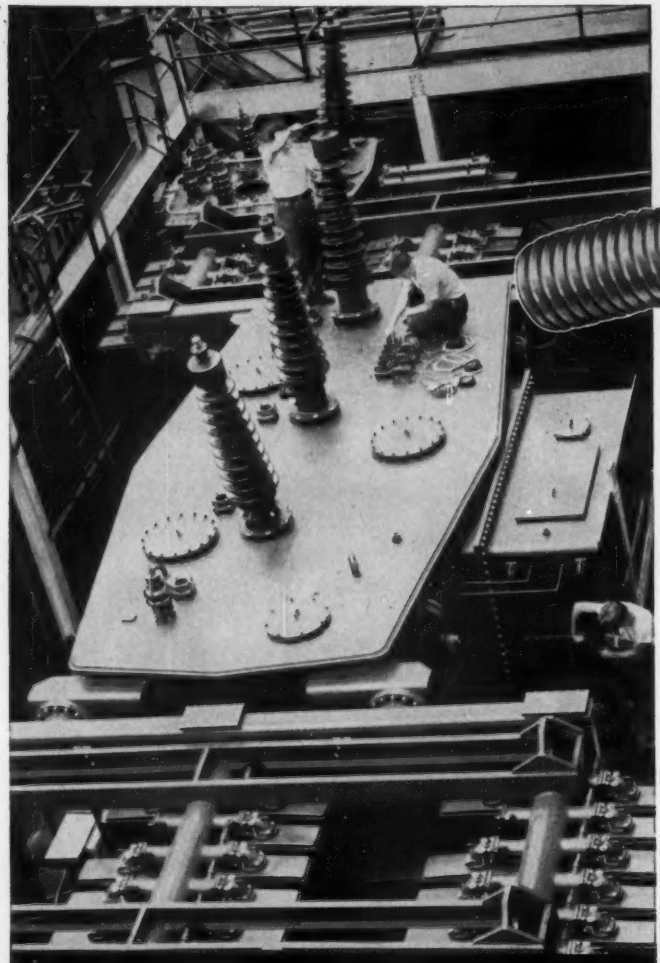
If you see signs of Skimpy Wiring in your own home, call an electrical contractor or consult your local power company. Learn how easily you can have safe, *adequate copper* wiring installed to make your home more *electrically livable!*

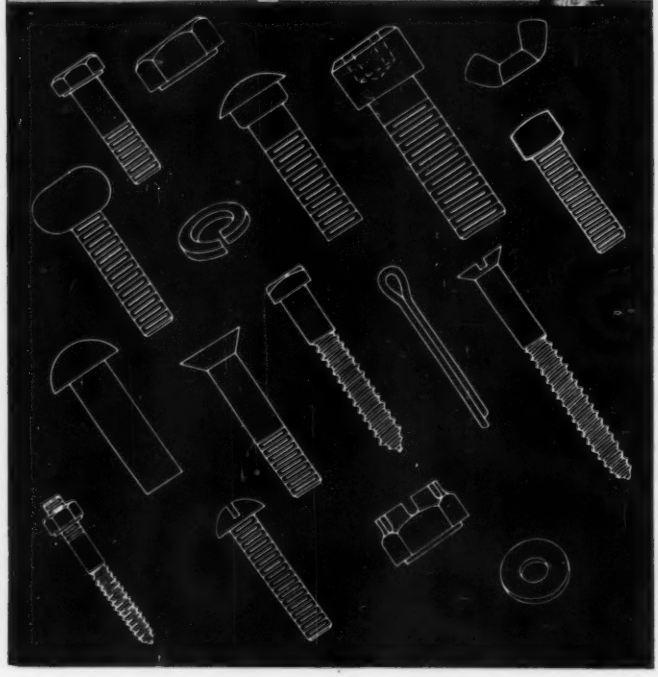
* * *

Get FREE Booklet! "The ABC of Home Wiring" explains facts about your electricity, how you can make it serve you better. Write Kennecott Copper Corp., Dept. S46, Box 238, New York 46, N. Y.

Kennecott Copper Corporation

Fabricating Subsidiaries: CHASE BRASS & COPPER CO. • KENNECOTT WIRE & CABLE CO.





½—13 x 3
Oval Neck
Silicon Bronze
Connector Bolt

STOP CORROSION

Enemy of Utilities!

Ugly, wasteful corrosion . . . shortening the life of utility equipment . . . adding to maintenance costs.

Prevent this Public Utility Enemy from gaining a foothold. Everlasting Fastenings by Harper solve corrosion problems—protect costly electrical equipment—give years of on-the-job service.

Harper corrosion-resistant fastenings are produced by the largest specialist in fastenings of non-ferrous metals and all stainless steels. Over 7,000 different stock items quickly available.

For specialized fastenings, Harper engineers and metallurgists are ready to serve you—backed by knowledge gained through 30 years' experience. Call on Harper—Branches and Distributors in all major market areas, or write for the new Harper catalog.

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EVERLASTING FASTENINGS

SPECIALISTS IN ALL
CORROSION-RESISTANT FASTENINGS

BULLETIN H 307-256

NOW!
IT'S NEW!
IT'S AUTOMATIC!

Moloney's New Distribution Transformer Plant Makes Dependable HyperCore Transformers Better Than Ever

Completely mechanized, Moloney's new distribution transformer plant employs assembly methods similar to those in the auto industry . . . doubling Moloney's capacity. *In addition,* EACH transformer is tested . . . *automatically* . . . by Moloney's new and automatic test system. Each transformer must meet NEMA standards *plus* Moloney's own high standards . . . or it's electronically rejected—automatically.

Moloney's new and automatic test system is your assurance that dependable HyperCore Transformers are better than ever . . . and performance proved. Moloney's increased production capacity makes superior HyperCore Transformers immediately available . . . when you need them . . . in the quantities, ratings and types you need.

MOLONEY ELECTRIC

MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES

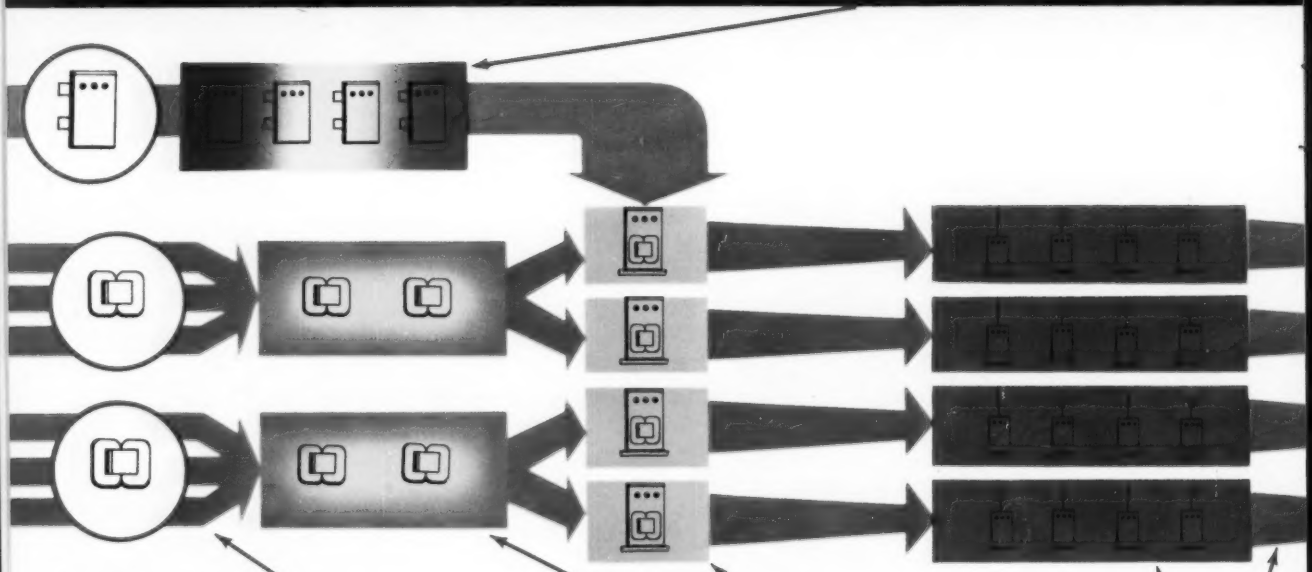
FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

STREAMLINED, MECHANIZED ASSEMBLY AND AUTOMATIC TEST LINES

Moloney's double production capacity and increased production flexibility makes dependable HyperCore Transformers immediately available in the quantities, ratings and types your utility requires.

Dependable HyperCore Transformers are better than ever . . . because every

After paint spraying and thorough baking, tanks are conveyed to assembly lines on crate bottoms to keep adjacent tanks separated, preventing scratches throughout assembly and test lines.



Schematic Flow Chart

Multiple core-and-coil assembly lines for HyperCore Transformers permit flexible production scheduling. After assembly, core-and-coil units receive complete ratio tests.

Conveyors move core-and-coil units through drying ovens . . . automatically . . . for heat treatment to remove moisture.

Immediately after drying treatment, core-and-coil units are tanked. Bushings, leads, and all final assembly operations are completed.

Conveyed into vacuum tanks while core-and-coil units are still well above ambient temperature, transformers are vacuum treated to remove any residual moisture and filled with precisely the right amount of oil . . . automatically . . . while under vacuum, preventing the trapping of air in transformers.

Final closing of tanks is done immediately after vacuum treatment. Tank covers are sealed by a confined corprene gasket

MOLONEY ELECTRIC

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES

DOUBLE CAPACITY . . . ASSURE 100% TOP QUALITY

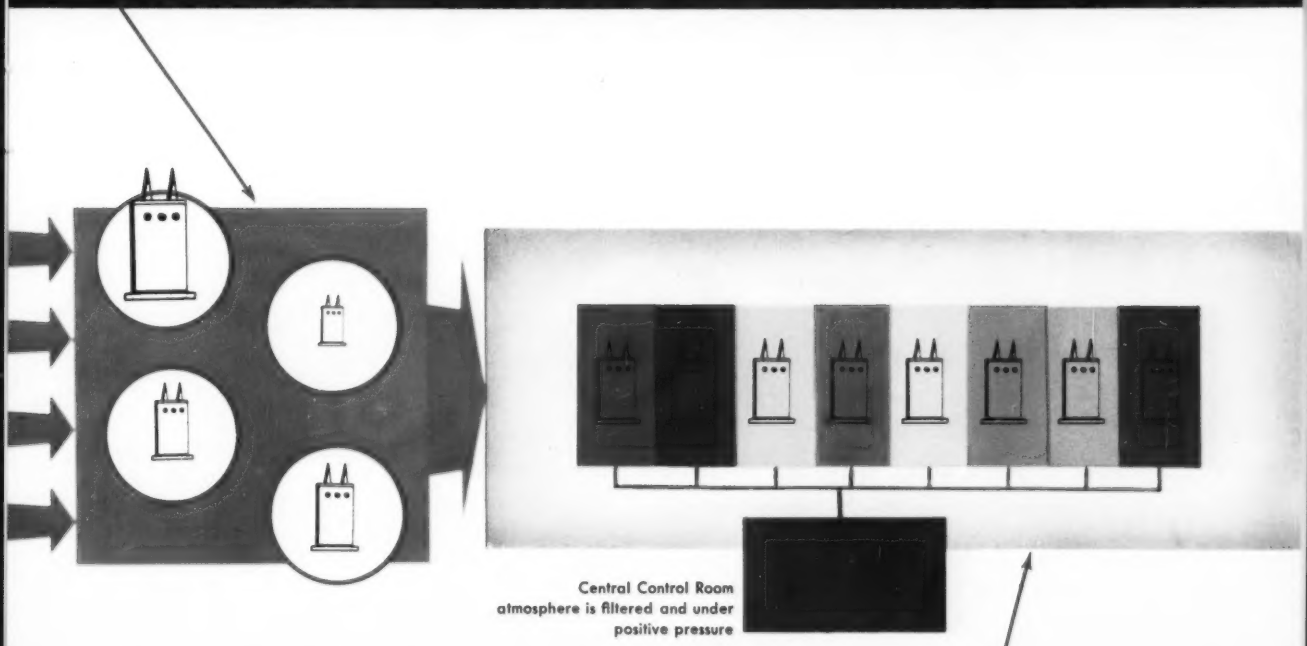
transformer is tested — automatically, while on a moving conveyor belt . . . eliminating human error. Electronic test equipment, designed specifically for each test, tests each transformer, analyzes results, approves perfect transformers . . . or rejects substandard transformers — automatically.

Production Capacity Doubled . . . NOW

Utility Demands Estimated To Double by 1965

Moloney Increases Production Capacity Today To Meet Utility Expansion Plans for Tomorrow

Transformers of similar ratings are grouped before testing to facilitate accurate, automatic tests.



Central Control Room atmosphere is filtered and under positive pressure

COPPER LOSS test equipment checks transformers for good circuits and connections . . . substandard transformers are rejected.

RATIO test equipment checks transformers for correct voltage ratio and ratio adjuster setting . . . or automatically rejects substandard transformers.

IMPULSE test proves each transformer capable of withstanding impulse surges . . . or automatically rejects substandard transformers.

INDUCED POTENTIAL test equipment proves turn, layer and divisional insulation quality . . . or automatically rejects substandard transformers.

APPLIED POTENTIAL test equipment proves winding and ground insulation quality . . . or automatically rejects substandard transformers.

CORE LOSS test equipment measures and records core loss and exciting current . . . and automatically rejects substandard transformers.

SOUND test equipment measures and records the audible noise level . . . and automatically rejects substandard transformers.

CSP BREAKER test equipment checks breaker operation under overloads, checks overload signal lights . . . and rejects substandard transformers.

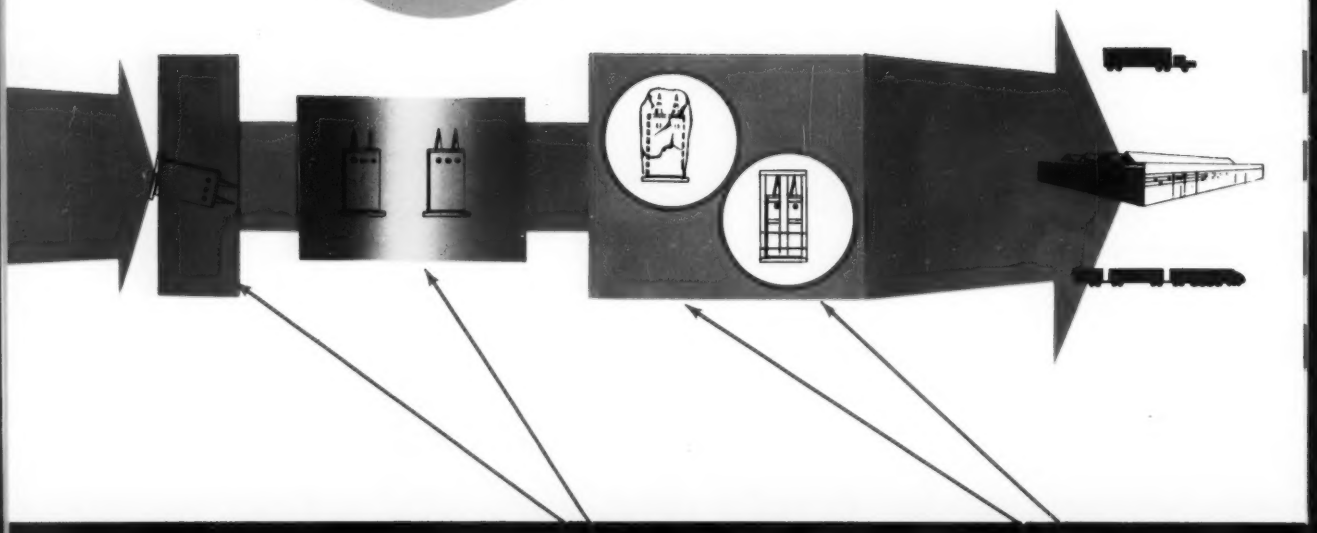
COMPANY

AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

SPECIFY MOLONEY HYPERCORE TRANSFORMERS

They're tested and performance proved . . . automatically . . . assuring dependable transformers — the best made — for your utility.

Warehoused throughout the country, better than ever HyperCore Transformers are immediately available when you need them . . . where you need them . . . and in the quantities, ratings and types desired.



Leak testing by tilting transformers . . . automatically . . . to slightly more than 90 degrees assures perfectly sealed covers and bushings.

Touch-up paint, if required, is sprayed on just before crating and baked by infra-red heat . . . just like the original paint . . . assuring a uniformly durable, weather resistant surface.

Polyethylene plastic covers protect transformers in shipment or storage . . . keeping them clean and fresh until needed.

Rigid, durable wood crates protect transformers against accidental damage and reduce handling costs in shipping or storage.

LITHO IN U.S.

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers • Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Study the Hoover Report

The Hoover Commission Report on Water Resources and Power is one of 19 Commission reports submitted to Congress last year. These reports propose changes expected to permit annual savings of $5 billion on government operations. They also offer the promise of a more effective government organization and better coordination of federal activities.

No estimate has been made of the savings which would accrue upon implementation of the ten recommendations relating directly to federal power activities. However, a final Commission report indicated they would be substantial. What's more important, a number of the proposals point the way toward a sounder, more equitable federal power policy.

Probably no person would agree completely with every one of the ten recommendations. Several members of the Commission filed varying statements of dissent. Task Force Chief Ben Moreell, himself, has expressed reservations to some of the final recommendations. But no person sincerely interested in better government could conscientiously condemn all of the power recommendations. The potential gains they offer are too great.

The first step toward forming sound opinion about any of the recommendations is to study the reasons behind them. To assist readers in this study, we present in this issue (p 103) the present status of each of the Hoover Commission recommendations on power and a brief sketch of its background. This material is drawn from the Commission report and Task Force studies which fill five volumes. These are a valuable contribution toward the evolution of a reasonable and acceptable power policy.

Information provided here and in the reports themselves will assist members of the industry to determine their stand on the various proposals.

Standardization Vital to Higher Service Voltage

Electrical manufacturers today hold the key to the next step toward higher residential service voltage. They must gauge its impact on design of appliances which promote electrical living and equipment required to serve them. Manufacturers must retain in the new designs the safety users expect in today's devices. And they must determine whether these new appliances and equipment can be manufactured to sell at prices which would preserve the hoped-for economic gains from the voltage change.

Formation of a joint committee to study these problems is in progress. It will bring together appliance information which has taken several years to compile and voltage recommendations recently proposed by Edison Electric Institute's Task Force on Higher Secondary Voltage. The Task Force has proposed 265/460Y as the best choice of voltage, with 254/440Y an acceptable alternate where service to 240-v appliances is important. Their reasons for selecting these voltage ranges were:

1. The greatest need for higher voltage is for commercial and industrial buildings where power requirements overtax the 120/208-v system.

2. Voltage approaching 480 gives optimum starting and running torques on 440-v motors while the corresponding phase-to-neutral voltage is suitable for high-level fluorescent lighting.

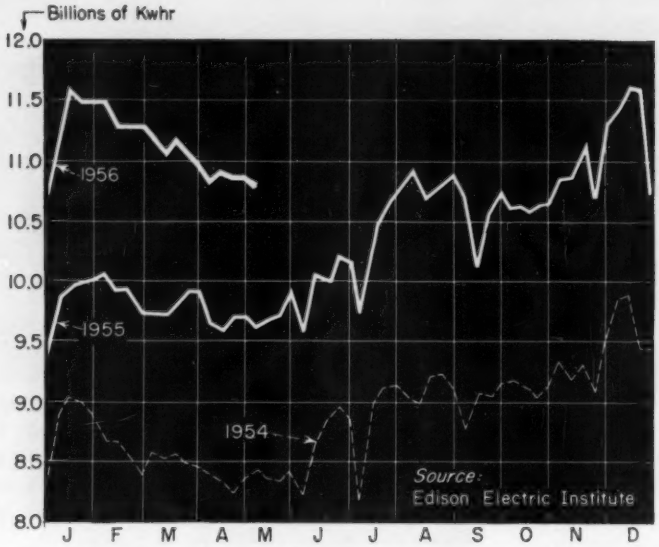
3. Preferred voltage tables give 480 as an upper limit. The nominal value which reaches this limit with customary tolerances is about 460v.

4. Where residential service also is involved, as for apartment houses or heavily electrified housing developments, the slightly lower 440v might be preferred. This phase-to-phase voltage would still give good performance for 440-v motors while the phase-to-ground 254-v is better suited for 240-v appliances.

5. Either of these nominal voltages is provided by full-capacity taps on standard 480Y/277-v transformers.

The unfaltering aim of EEI's Task Force was to select that value of higher voltage which would provide maximum advantages to both consumer and utility distribution systems. The new joint group must, with equal diligence, evaluate the effect of these voltages on design and application of motors, appliances, and equipment.

Recommendations of the joint committee will have lasting effect on the entire electrical industry. If a new residential service voltage eventually receives endorsement, it must be delineated promptly by new standards. And utilities which adopt the new voltage must do so judiciously and in rigorous conformity to the new standards. For standardization from the beginning is vital if the new service voltage is to provide the fullest benefits to the electrical industry and the customers who support it.



OUTPUT

Week ended May 5
10,815,000,000 Kwhr
Up 12.8%

Atomic Energy Commission requirements — 1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 9.8%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
May 5	+12.8	+12.9	+7.5	+18.9	+11.1	+12.3	+6.4	+13.6	+15.1	+11.4
April 28	+12.0	+10.2	+7.5	+19.4	+11.4	+12.7	+4.0	+10.5	+8.8	+9.3
April 21	+12.3	+13.0	+8.4	+19.0	+10.0	+15.5	+4.9	+10.0	+9.6	+2.9

Seasonally Adjusted Index 214.6 Week Ago 214.3 Year Ago 190.0

Issue's Highlights—Case for private power is punched out by Harold F. Schnurle, Central Maine Power vice president, in answer to speech by Leland Olds . . . AEC gives go ahead on construction of reactors proposed by Consolidated Edison of New York and Commonwealth Edison of Chicago . . . Joint Congressional Committee on Atomic Energy begins hearings on problem of insurance coverage for atomic power installations; supplemental government coverage to be considered . . . Army Corps of Engineers reports its hydro capacity exceeds 4 million kw . . . Pictures tell story of Duquesne Light's installation of 69-kv pipe-type cable to serve new downtown Pittsburgh substation.

Citizens Vote Against Municipal Ownership—Residents of Lake City, Fla., by overwhelming majority of 1808 to 672 have voted against municipal ownership of power facilities. Florida P&L had been engaged in franchise dispute with city officials.

Recent Labor Settlements—West Penn Power and UWUA sign five-year contract, first such agreement in electric utility industry. Total value of money items in first year amounts to 14.3¢ an hour while five-year package exceeds 52¢ an hour . . . Georgia Power has signed with IBEW for a wage increase averaging 4% with a slight change in fringe benefits. Two-year contract with wage reopener after one year expires March 1, 1958 . . . Clark County, Ore., (PUD) and IBEW agree to $2.85 an hour for journeyman linemen with other jobs increased proportionately.

Co-op Will Add Steam Unit—REA has approved loan of $3.9 million to Plains Electric Generation and Transmission Co-op of Albuquerque, N. M., to finance 16,500-kw steam generating unit. REA also approved contract between co-op and PS of New Mexico for delivery of 10,000 kw of firm power, and a reserve of 16,500 kw at Albuquerque.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Off Washington Wire—President Eisenhower said he favors letting New York State decide whether private or public interests should develop Niagara. But he noted Congress has reserved for itself the right to decide . . . Latest reports put Dwight W. Myers, president of Iowa Rural Electric Cooperative Association, and Miles Horst, Pennsylvania Republican state chairman and several times head of State Agriculture Commission, tops in the running for post being vacated by Rural Electrification Administrator Ancher Nelsen. Nelsen has announced he will resign to run for governorship of Minnesota.

Both versions of highway bill now before Congress assure utilities of federal reimbursement to all states that pay cost of utility relocations made necessary by road improvements . . . Hearings begin May 15 on proposals to set up a government atomic energy insurance program. Top government and atomic industry officials will testify. Following week, the Joint Atomic Energy Committee will begin hearings on Sen Albert Gore's bill to authorize construction of six full-scale federal atomic power plants.

Latest Financing—Money rates were mixed last week. First Boston Corp won $30-million Niagara Mohawk Power first mortgage 3⅜% bonds (Aa) due 1986 at 100.639%; reoffered at 101.377% to yield 3.55%. This compared with two other "Aa" offerings recently, Wisconsin Electric Power to yield 3.77% and Southern California Edison to yield 3.68%. Shields & Co group won $16-million California Oregon Power first mortgage 3⅞% bonds (A) due 1986 at 100.28%; reoffered at 101.335% to yield 3.80% . . . Halsey, Stuart & Co won $4.5-million Savannah Electric & Power first mortgage 3⅞% (A) due 1986 at 101.3356%; reoffered at 102,239% to yield 3.75%. These two latter issues compare with Kentucky Utilities (A) offering on April 12 which yielded 3.67%.

Court Upholds Surcharges—Oregon Supreme Court has decreed that surcharges collected by three power companies during a water shortage in 1952 were established by the state utilities commissioner as lawful rates. The surcharges had been applied by Pacific P&L, Portland GE, and Mountain States Power, now part of PP&L, when they purchased large quantities of steam-generated energy during the water shortage.

ABOUT PEOPLE IN THE INDUSTRY

For outstanding contributions "both to theory and to design and construction of fast computing machines," Dr John von Neumann, AEC commissioner, has been named first recipient of Enrico Fermi Award. In recommendation for the award, Dr Neumann is cited as "one of the great mathematicians of this generation" whose contributions to computers, now commonplace in industry, have greatly speeded peaceful growth of atom.

Question of "being first for first's sake" in peacetime nuclear power development is more matter of national policy than one of economics, according to Louis H. Roddis, deputy director, AEC's division of Reactor Development. Liability insurance for nuclear power plants "is a problem, but it is not holding up the reactor development program" although there are people who feel they can't go further until this is solved.

More News About People page 198

Hot Debate:

H. F. Schnurle

Versus

Leland Olds

Public Power Attacked, Defended

A raging debate on the public-vs-private power issue recently occupied the spotlight in Maine as staunch supporters of each side locked horns at Colby College in Waterville.

"I am convinced that 'socialization' or 'nationalization' . . . of the electric power industry could well constitute the first step toward total disintegration of our system of free enterprise which is the backbone of American capitalism," declared Harold F. Schnurle, vice president of Central Maine Power Co, as he spoke out on the side of private power.

Schnurle's talk, entitled "Public Power—the First Step Toward Eventual Socialization?," was presented in answer to a speech given on the same Colby College platform six days earlier by Leland Olds, former Federal Power Commission chairman and long-time public power advocate.

'Monopoly', Claims Olds

Speaking on "The Public Power Issue in 1956," Olds had charged that the private power industry was monopolistic, and that it was using a "campaign of mass mesmerism" to "brainwash the American people" thus reversing "traditional" policy.

"The monopoly policy," said Olds, "would end federal power supply partnership with communities electing to be served by public or cooperative electric systems. It would sanction, instead, the formation of new regional private power supply combinations, assisted by the government and exempted from even the regulatory authority of the Securities and Exchange Commission. This would mean the ultimate end of public competition and the enthronement of . . . monopoly."

Lauding public power's part in "maintaining a competitive influence on privately-owned power systems in the age of Giant Power," Olds asserted that the anti-monopoly principle meant that "public and cooperative electric systems had access to low-cost wholesale power supply."

Aside from low-cost rates, measured by the Tennessee Valley Authority yardstick, Olds said other benefits of electric service brought about by public power included a marked decrease in private utility rates in areas near public power territory, and an increase in capacity and common stock earnings of utilities in these areas.

'Socialism', Retorts Schnurle

Olds' defense of public power as part of the American tradition was countered with Schnurle's statement that "the price we pay for public power must be measured by the advance of 'socialism' in our midst and our concurrent loss of liberty."

Schnurle illustrated with Socialist party platforms of 1920 and 1928 which advocated "nationalization of our natural resources," including Boulder Dam and Muscle Shoals, and which praised TVA as "the only genuinely 'socialistic' act in the New Deal . . . a flower in the midst of weeds."

Turning to Olds's claim that public power resulted in reduced rates to consumers, Schnurle retorted, "The few who receive government goods and services naturally find them 'cheaper.' But the losses of government business add to the tax bills of all. Actually the taxpayer loses three ways:

1. "Tax exemptions of government businesses increase everyone else's share of government's costs.

2. "Capital investment for these enterprises adds . . . to the national debt; this increases the interest payments which are part of the tax burden.

3. " 'Hidden losses' help swell the federal deficit, which also adds to the debt and the interest."

Olds's statement that utilities located near public power developments "have been forced to lower their charges due to government competition," said Schnurle, "is designed to discredit the excellent record of free enterprise companies whose charges have steadily been reduced due to increased customer use, technological advances, good management, and many other factors." He said if Central Maine Power were "to be accorded the same tax treatment TVA is given, it could reduce its charges by almost 20% without affecting its net earnings one penny."

Yardstick Termed A Misnomer

Referring to Olds's support of the TVA yardstick method in measuring rates of investor-owned utilities, Schnurle charged that "in the light of its present use the term 'yardstick' is a misnomer for . . . it is about 18 inches too short."

"The first six inches," he said, could be "charged off to the 'use of economically unjustifiable methods of allocation of the costs of TVA's multipurpose dams,' " and the second six inches to " 'freedom from accountability' for the interest cost of appropriated funds

(*Continued on page* 99)

AEC Okays Two Utility Reactors

Construction permits issued for atomic power plants proposed by Commonwealth Edison and Consolidated Edison

Consolidated Edison Co of New York and Commonwealth Edison Co of Chicago have been granted construction permits by the Atomic Energy Commission to build large developmental power reactors—permits granted for nuclear plant construction without federal participation.

Con Ed plans a 236,000-kw pressurized water reactor, to be built on its 350-acre Indian Point site 24 miles upstream from New York City on the Hudson River. The plant will obtain 96,000 kw of its output from an oil-fired super-heater. The reactor will cost $55 million.

Commonwealth plans a 180,000-kw dual cycle boiling water reactor which will cost about $45 million. The utility will spend $30 million of this, in return for ownership of the plant. The remaining $15-million costs will be shared by Commonwealth with a group of associates, all of which will benefit from the technology gained in its construction and operation. The plant will be built on a 950-acre site about 50 miles southwest of Chicago.

Permits Approve Construction

The construction permits granted these firms are not licenses to operate nuclear facilities. But they constitute official permission to shape into concrete and steel the plans designers have worked on for the last year. Issuance of a construction permit is tantamount to licensing, however, for AEC has carefully examined both companies' reactor plans, and the permits would have been withheld if designs had not proved to have been satisfactory.

Both plants are scheduled for completion in the fall of 1960, and both are assured of 40-year supplies of U-235, the fissionable uranium which sustains a chain reaction. Con Ed will receive an estimated 5,699 kg of U-235 during that period; Comonwealth, 8,-323 kg. Con Ed expects to consume 155 kg of this each year during steady operation, producing 140 kg of U-233 and burning up 62 kg of this fissionable material. Commonwealth will use 225 kg of its government-supplied fuel each year.

Babcock and Wilcox Co holds Con Ed's design contract. It has drawn plans for a reactor which will use thorium metal as a "fertile" material placed in the core for conversion into U-233. Its uranium fuel is highly-enriched.

Commonwealth's design was worked out by General Electric Co in conjunction with Bechtel Corp as engineer-constructor. Its plant will use slightly-enriched uranium.

Last week, AEC approved a contractor for the seventh type of reactor in its current development program. It chose Babcock & Wilcox, Con Ed's designer, to design, build, and operate a liquid-metal-fueled reactor experiment, making use of the technology learned by AEC during experiments with an LMFRE test facility at Brookhaven National Laboratory. A Brookhaven team recently reported favorably on experiments.

B&W will subcontract with Union Carbide Nuclear Co for chemical processing of fuel.

The six other types of reactors chosen by AEC for inclusion in its research and development program are pressurized water, homogeneous, fast breeder, boiling water, sodium graphite, and organic moderated.

Co-op Ok's Sale to Portland GE

Sandy Electric members vote 517-99 to accept utility's $1,007,300 offer; new rates will be about one-third less

Sandy (Ore.) Electric Cooperative members, weary of paying bills one-third higher than their neighbor' and worried about the debt-ridden system's shaky-looking future, voted late last month to accept a "willing but not anxious" Portland General Electric Co offer of $1,007,300 for the co-op.

The vote was 571 to 99, a comfortable margin over the two-thirds endorsement required by state law. It came 15 days after a more than 2 to 1 rejection of the hurried bid of another co-op, Consumers Power, Inc, of Corvallis, to pay $2,700 more than PGE's price (EW, April 23, p 26).

PGE's payment permits the Sandy co-op to settle a nearly $1-million debt to Rural Electric Administration. The members, scattered in a rural area east of Portland, may get rebates on facilities they've installed at their own expense. The co-op's employees will all be retained.

After the balloting, PGE Board Chairman Thomas W. Delzell said the investor-owned company would begin serving the Sandy customers tomorrow, May 15. Rate reductions will cut about a third or more off past Sandy bills.

One spokesman reported PGE had at no time actively promoted the sales. Despite almost 300 petition signers who asked for the company's service in the last two years, PGE maintained a "hands off" policy: And members had been told the company would be willing to negotiate for the co-op system but under no circumstances would the company initiate the action.

Early this year Sandy members voted to open negotiations. PGE's bid was submitted in March (EW, Feb. 13, p 48), a bid the co-op's public power-minded board of directors generally opposed. They preferred, instead, Consumers Power's offer that arrived about a month later. When the members voted it down (444 to 209) the board had no alternative but to submit the PGE proposal for a vote.

Said Delzell, "We are gratified that the (Sandy) members have approved the sale. . . . We feel that members of the co-op—as were we—were motivated by common sense business considerations.

"They will enjoy the same low rates that all our other customers enjoy and will have the quality of their present service improved just as soon as possible." he said.

Atom Insurance Set for Airing

. . . before joint Congressional unit which begins hearings to consider government plan to supplement private coverage

Stumbling blocks in the way of developing economical atomic power will be lined up for government inspection when the Joint Congressional Committee on Atomic Energy begins hearings today (May 14) on the problem of atomic insurance.

Insurance against the unprecedented risks of operating nuclear power plants has been characterized by leaders in the development program as a problem threatening to bring the entire program to a halt.

This warning comes from big utility names: Walker Cisler, president of Detroit Edison Co and head of one of the biggest atom power ventures, Power Reactor Development Associates; Willis Gale, chairman of Commonwealth Edison Co and also a leading figure in an atomic power plunge; and William Webster, president of the newly formed Yankee Atomic Electric Co, an association of New England utilities formed especially to build an atom plant.

And their warning is underscored by reactor makers such as Francis McCune, vice president of General Electric Co and head of the company's Atomic Products Division.

These spokesmen recently startled Congress by rejecting as inadequate the $60-$65 million in liability insurance offered by the private insurance carriers. Until then, members of the joint committee had been quietly convincing themselves that the insurance companies' offer would be adequate to permit private reactor operators to go ahead with their atomic plans.

Many of the reactor builders held forth only one foreseeable solution: A government-underwritten super-indemnity program to protect nuclear power plant operators against liability risks exceeding the amount covered by private insurance.

Legislation has been introduced to provide such a program, and it is this which is ostensibly the object of the hearings.

But it is known that Joint Committee Chairman Clinton P. Anderson (D-N.M.) and others familiar with the atomic power programs of this country are not at all satisfied with U. S. progress. They have, in fact, indicated displeasure with the reluctance of U. S. developers to move ahead until problems such as the insurance matter are worked out.

So they want to find out just what problems remain. They have already discovered—from these same utility leaders in the reactor business—that freedom from the restrictions of the holding company act is necessary before private companies can pool their resources for economic attack on the atom. Hearings are now progressing before another committee on that problem (EW, April 30, p 58).

Anderson Letter Outlines Plan

Preparatory to today's hearings, Anderson sent out an open letter to organizations interested in the atomic power program and the indemnity question, inviting them to appear at the hearings.

His letter also outlined a basic legislative proposal on governmental indemnity which would supplement private insurance coverage of extraordinary hazards. His proposal contained the following provisions:

- Governmental indemnity to supplement a reasonable amount of third party liability insurance to be provided by the private insurance companies at reasonable rates.
- A $500-million ceiling to be placed on indemnity for any single disaster with any damages over this amount to be handled by special legislation.
- Liability of reactor operators and equipment makers to be limited to their private insurance coverage, together with funds made available under the indemnity program.
- Minimum charge a year per reactor to be made by the government for

(*Continued on page* 99)

Army Engineers Report Hydro Capacity

The U. S. Army Corps of Engineers reports hydro capacity of its civil works projects now total more than 4 million kw. Addition of 12th 70,000-kw unit at McNary Dam, which went into production recently, passed that mark. Here's rundown on Army's 25 major water projects:

Project	*Capacity (kw)*
Albeni Falls, Idaho	42,600
Allatoona, Georgia	74,000
Blakely Mountain, Arkansas	75,000
Bonneville, Oregon & Washington	518,400
Bull Shoals, Arkansas & Missouri	160,000
Center Hill, Tennessee	135,000
Chief Joseph, Washington	256,000
Clark Hill, Georgia & South Carolina	280,000
Dale Hollow, Tenn.	54,000
Denison, Oklahoma & Texas	70,000
Detroit, Oregon	118,000
Fort Gibson, Oklahoma	45,000
Fort Peck, Montana	85,000
Fort Randall, South Dakota	320,000
Garrison, North Dakota	160,000
John H. Kerr, North Carolina & Virginia	204,000
Lookout Point, Oregon	135,000
McNary, Oregon & Washington	840,000
Narrows, Arkansas	17,000
Norfolk, Arkansas & Missouri	70,000
Philpott, Virginia	14,000
St. Marys River, Michigan	18,400
Tenkiller Ferry, Oklahoma	34,000
Whitney, Texas	30,000
Wolf Creek, Kentucky	270,000
Total:	**4,025,400**

Duquesne Light Installs Pipe-type 69-Kv Cable for Pittsburgh Area

Cable section enters feeding tube . . .

which eases it into pipe extending to . . .

manhole where pull fitting is removed.

A six-mile length of 69,000-v pipe-type cable, which will supply half of downtown Pittsburgh, Pa., with electric power, has been installed by Duquesne Light Co to feed its new Forbes substation when it goes into operation late this year.

First of its kind in Pittsburgh, the cable is composed of 27 sections, portions of which are under both the Ohio and Allegheny Rivers. When energized, this single cable will replace eight 11,000-v cables now being used to carry the power. The cable is 1½ million circular mills in size and will carry about 900-1,000 amps.

Pulling line powered by 18-ton winch.

APPA's Alex Radin (left) and W. E. Hooper

U.S. Atomic Role Attacked by Gore At APPA Meeting

"We do not have a national policy in the field of electrical energy which meets the requirements of the times," charged Sen Albert Gore (D-Tenn.), keynote speaker at American Public Power Association's recent 13th annual convention.

The three-day meeting, held in Los Angeles, featured discussions by speakers from government, industry, and local utilities on topics such as atomic power, its costs, availability, technology, and hazards; public vs private power; rural electrification; and the all-electric home.

Need for Action Stressed

Focusing his talk on the role of the U. S. in the atomic energy field, Gore asserted, "Our overall policy in the field of nuclear power fails utterly to recognize the urgency of action to insure our leadership in the field." The U. S., he said, hopes by 1960 to have something over 1-million kw of capacity in being, but "we have no real plan for achieving even this objective." He compared this to Russia's proposed figure of 2.5-million kw for the same year and to the British ten-year plan for about 2.5-million kw. The federal government can and should undertake an atomic power program with a minimum goal of 2-million kw by 1960 for the benefit of all the people, he said.

"With proper engineering and careful operating procedures there is no reason why the environment of a nuclear power plant should ever become significantly contaminated," remarked J. Z. Holland, executive secretary, advisory committee on reactor safeguards, Atomic Energy Commission. Potentially hazardous materials in a full-scale reactor mostly will be in solid form, he added, and cannot be dispersed except under extremely unlikely circumstances.

The stand that publicly owned utilities need to participate in the making of decisions which will have long term effects on the technology, cost, and availability of atomic power, was taken by James L. Grahl, of APPA's atomic energy service.

"Private power people have it figured," charged APPA president W. E. Hooper, "that they have some God-given right to provide every kilowatt hour in the country at rates of their own choosing. Anything that affects their supposed right, either as to territory or rates, is called socialism."

"Increasingly, private power companies are emphasizing the tax question in the public vs private power controversy," said Alex Radin, general manager, APPA. "Although we are on firm legal as well as policy grounds, the constant barrage has served to mislead and confuse many people. While we cannot hope to muster the financial or other resources of private power," he said, "we can serve a useful public service by making a broader dissemination of the facts about public power."

Hardest Rural Job Lies Ahead

The second and probably hardest job in rural electrification—the expansion of facilities to handle load growth and demand—is just beginning, predicted J. E. Smith, president of National Rural Electric Cooperative Association. Farm consumption will continue to double every 4-5 years, as compared to every 7½-10 years industry-wide, he said.

Federal development of the Hells Canyon site is the key to maximum development in the Pacific Northwest, stated Rep Edith Green (D-Ore.), adding that more low-cost power is needed because our real reliance must be on new industrial growth—heavy power using industries that will develop our mineral resources.

Largest percentage increase in sales over the next 10-15 years will come in those present rate classifications which offer inducement for greater use but little or no incentive for load factor improvement, said H. W. Steinmeyer, Consumers Public District. Future rate structures should lend encouragement to improvement of load factor and development.

Government Atom Pushed

Resolutions passed by APPA delegates called for action affecting the industry nationally and locally. In the nuclear power field, resolutions called for the federal government to undertake construction and operation of nuclear power plants and for marketing and wheeling of power to preference customers.

Delegates also resolved to oppose changing the holding company act, to call for Congressional investigation of and legislation to curb private company "political" advertising, to oppose accelerated tax amortization, and to favor authorization of national banks to underwrite certain types of revenue bonds.

Elected as the next president of APPA was William S. Peterson, general manager and chief engineer, Los Angeles Department of Water & Power.

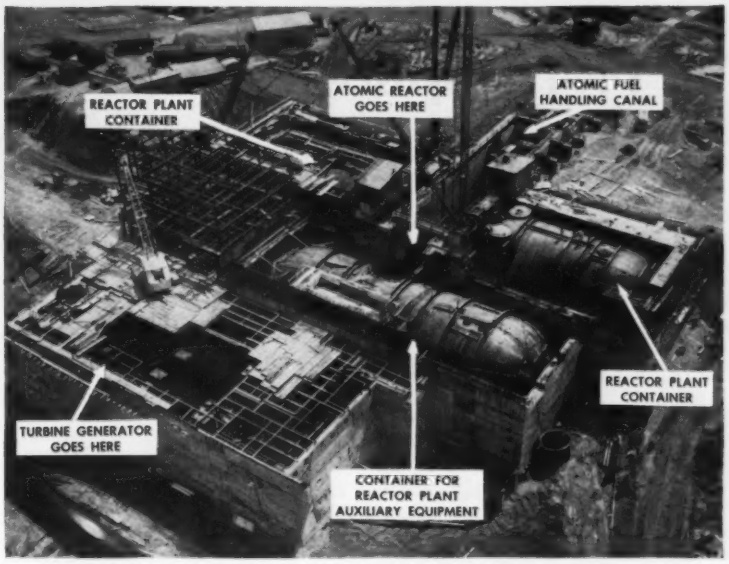
Construction Strides at Shippingport Praised

Construction of Shippingport atomic power plant (right) is progressing rapidly toward scheduled initial operation in mid 1957, Philip A. Fleger, Duquesne Light Co's chairman, reported last week. This observation was made during an inspection of the site by Sir Edwin N. Plowden, chairman of the British Atomic Energy Authority, who also commented on his nation's atomic development.

Sir Edwin expressed confidence that Shippingport will be the world's first full-scale power reactor installation. Calder Hall, he said, will produce 60 to 75 Mw starting October 1956 but with a dual-purpose reactor designed to convert slightly-enriched U-235 to plutonium for military uses.

Also dual-purpose are five other reactors under construction in Britain, but contracts will be awarded this summer for the first two of 12 power reactors. These power reactors, Sir Edwin continued, will be designed and built by private industry for various electricity authorities. The goal is power cost competing with coal at about 7 mills per kwhr, he said.

Rear Admirals Lewis L. Strauss, chairman of the U. S. Atomic Energy Commission, and Hyman G. Rickover, chief of AEC's Naval Reactor Branch, reviewed nuclear power progress in the U. S. They pointed out that authorized or proposed projects assure 1-million kw of atomic power by 1961. Within ten years, predicted Strauss, atomic power will be competitive with conventional fuels throughout much of the U. S. but not with falling water.


REACTOR PLANT CONTAINER
ATOMIC REACTOR GOES HERE
ATOMIC FUEL HANDLING CANAL
REACTOR PLANT CONTAINER
TURBINE GENERATOR GOES HERE
CONTAINER FOR REACTOR PLANT AUXILIARY EQUIPMENT

Progress at Shippingport atomic power plant is shown in recent photo

Atomic wastes do not present serious problems at present, said Strauss. Before atomic plants become numerous these wastes may be regarded as valuable by-products, he added without elaborating. Experience with the Nautilus, commented Rickover, proved that waste materials can be dumped into the water, after back-storing and evaporating, without impairing its use even for drinking purposes. At Shippingport he sees no prospect of adding radioactivity to the river.

Hot Debate Rages

(*Continued from page* 94)

from Congress and the difference in cost of 20-year Treasury bonds . . . and the average cost of funds under private utility operation. The final six inches . . . represents the tax differential between TVA and a hypothetical private operation."

"This is the mythical yardstick of which you are constantly reminded and . . . the dollars necessary to make up the 18-inch subsidy comes out of the pockets of the taxpayers of this country . . ." he said.

In reply to charges of brainwashing by private utilities, Schnurle countered with examples of "federalized brainwashing" in the form of thousands of pamphlets by TVA, Bonneville Power Administration, and the three-volume report by the Water Resources Policy Commission. "In my opinion," he said, "many millions of taxpayers dollars are being used both directly and indirectly" for what he termed "pure unadulterated propaganda or 'brainwashing.'"

Schnurle charged that Olds's attack on rate comparisons "were unfair without consideration of all facts," among which are "density of population, state and local taxes, transportation costs on materials and supplies, wages, and cost of fuel."

He referred to Olds's charge that "Because private monopolies have no incentive to dynamic sales policies or effective cost control," state regulatory commissions have had to adopt a static approach to the fixing of rates. Olds had also charged that regulation must "assume that actual costs shown on the books of the companies are reasonable."

"I can only add," said Schnurle, "that it is evident Mr Olds has never had a rate case before the Maine Public Utilities Commission."

Atom Insurance

(*Continued from page* 96)

its indemnity coverage, with proceeds to go to AEC's safety research and development program.

Anderson said the joint committee will consider legislation combining features of a bill by Rep Melvin Price (D-Ill.) to set up a federal indemnity program to relieve reactor owners of liability above amounts covered by private insurance companies, and those of a bill by Rep Sterling Cole (R-N.Y.) to limit liability of the reactor owner.

After the indemnity question has been considered, Anderson plans to follow up with public discussions on the civilian reactor program as a whole and "legislative proposals for its acceleration." The latter, he said, include such items as Sen Albert Gore's (D-Tenn.) bill directing AEC to build and operate at least six different types of commercial power reactors.

Fiord Span Is 3 Miles Long

VIBRATION DAMPER is being mounted on end of the line. There are eight such vibration dampers on each end of line

The 3-mile transmission span built last fall across the Sognefiord, one of western Norway's largest fiords, is more than 400 ft longer than the line across Messina Straits linking Sicily with the Italian mainland, heretofore the world's longest.

The Norwegian crossing is a link in a high-voltage power line for distribution to districts along the fiord. It joins Rabnaberg on the south side with Fatlaberg on the north, its position having been selected after careful investigation and consideration of all factors. Available shorter crossings were exposed to snow slides.

Insulated for 150 Kv

The power line transmits at 60 kv, but its insulation was specified with a view to its voltage being raised to 150 kv. Horizontal lengths of the lines are as follows: Phase 1, 15,872 ft; Phase 2, 15,847 ft; Phase 3, 15,951 ft; and, the spare line, 16,036 ft.

Average height of dead-end tower sites is 1,575 ft at Rabnaberg and 2,560 ft at Fatlaberg. Free height of the line above highest water level is 225 ft. Owing to ground conditions, the distance between phases varies between 138 and 213 ft. The towers, built on the site, are reinforced concrete, three-legged pylons.

The lines are hot-dip galvanized steel having a tensile strength of 250,000 to 280,000 psi. It consists of 37 strands and a center core with a diameter of 0.14 in. Including three layers of strands, diameter 0.125 in., the total cross-section is 0.465 sq in., or about 600 cir mils.

Strands Specified

For a single strand, before laying, the following guarantee was requested: Nine bendings over a radius of 0.3 in., 11 torsions on a 12½-in. test length, and a minimum of 4% elongation at the breaking point for a test length of 8 in.

Strain yokes and insulators, supplied by Ohio Brass Co, consist of two parallel, 3-string yokes whereby line stress is distributed on six insulator chains. The insulators have a breaking strength of 25,000 lb. The lines, having eight vibration dampers on each end, take a stress of about 33,000 lb. Calculated maximum stress of 51,250 lb includes an ice load of nearly 1 lb per ft at 13F below zero.

Pourings Begin

Fatlaberg's first pylon was poured June 29 and its fourth on July 22, each whole pylon being poured in one day. Rabnaberg's pylons were poured August 2 to 17. Sand, gravel, and concrete tests were made at each pylon, and the reinforcing steel was put to extra (Brinell) tests. The pylons were not exposed to stress until 28 days after pouring.

The line was delivered from White Cross Co, Ltd, England. Line drums were placed in the hold of a ship, and the free end was taken up to Fatlaberg. After the end had been secured in a pylon, the boat crossed the fiord, the line being laid out and fastened to 50-gal gasoline barrels with about 130 ft distance between. The other end was brought ashore and fastened temporarily. Correct sag was fixed by means of a telescope based on a sighting line about 225 to 230 ft above highest water level.

Italian Line 220 Kv

During erection, walkie-talkies kept the boat, stressing crew, and the surveyor in touch.

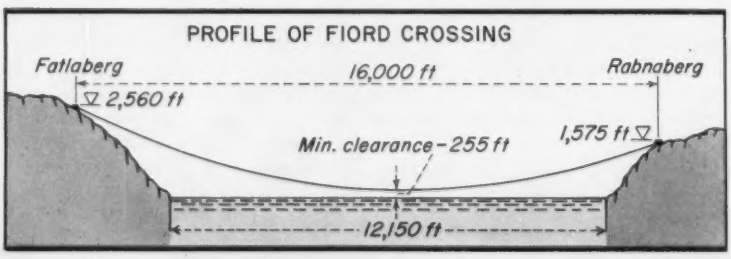
The 220-kv line across Messina Straits, also completed last fall, has two 738-ft towers, one on the rocky plateau of the Calabrian coast and the other in a sandy stretch of the Sicilian coast. Span length is 11,882 ft.

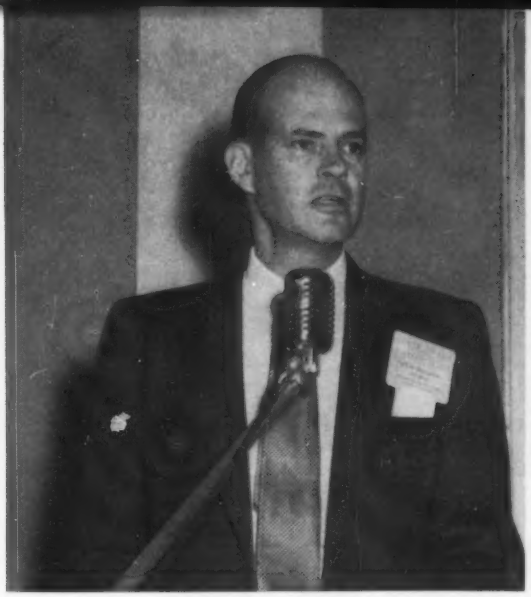
Tower on Concrete Block

The Sicilian tower is set in a concrete block having the shape of a cross. Each end of the cross bears on a pile sunk 65.6 ft in the sand. Tower stability has been calculated with a view to its withstanding an earthquake causing the collapse of one of the four piles. Each tower weighs 450 tons and is 114.8 ft wide. Both have been calculated for a 93.2-mph wind. They are made of sectional iron components welded together.

Each tower has an elevator moving along the outer side of one leg and a staircase leading to the top.

(*Continued on page* 203)





ENGINEERING MEETING

George S. Dinwiddie, president, Southeastern Electric Exchange, Tells Engineering and Operating Meeting . . .

Engineers Judged on 'Extra' Effort

Administrative ability is rarely judged solely on adequacy in a line assignment. Performance "above and beyond the call of duty" is also considered, G. S. Dinwiddie, president of New Orleans Public Service and of Southeastern Electric Exchange, told the Engineering and Operation Section of SEE in Augusta, on April 12-13.

For this reason, he said, your growth and advancement need nourishment derived from knowledge of related company functions and the continuous reaching for wisdom. One way to obtain added knowledge is to encourage individual study and to experiment with conference techniques among department heads.

Warn Public Against Socialism

Telling the American public the facts about socialized power is a job for everybody, it's not a job for management alone, S. E. McMeekin, president of South Carolina Electric & Gas Co, told SEE engineers. An enlightened public will demand changes in the preference clause and tax inequities.

McMeekin warned that REA is being shrewdly converted into a mammoth, tax-exempt, partially subsidized power cooperative. Top-level control of cooperatives is becoming more interested in serving large industrial and commercial customers in and near large cities than in serving rural areas.

Every employee is a potential salesman of good will for his company, K. W. Haagensen, Allis-Chalmers Manufacturing Co, said. But to do an effective job, the employee must first be given the facts and be treated with consideration.

The actions of switchboard operators, parking lot attendants, and receptionists are very important parts of any PR program, Haagensen said. They should make people feel important by giving quick courteous service. People remember negative information, "See that they know something nice about you," he advised.

Establish standards of service quality that will satisfy both customers and the company, yet are economical, L. B. Murray, Alabama Power Co, urged the delegates. Be sure to provide boundaries on the standard for voltage regulation, continuity of service, and flicker.

Murray said that interruptions of two hours or more per year in a small town have caused complaints. This was concluded, he said, from service record of 13 towns for five years.

Utilities must look ahead to provide locations for future facilities and to acquire them at reasonable costs, L. W. Cadwallader, Potomac Electric Power Co, counseled. Planning five or 10 years hence is not enough. It should be 25 to 30 years or more. This longer time is needed, he said, because of the difficulties in getting suitable sites and rights-of-way as their costs mount.

Dependability of nuclear power production is one of the major unknowns in this area today, F. W. Argue, Stone & Webster Engineering Corp, asserted. Nuclear power cost estimates to date have been based on an assumed capacity factor and an assumed number of operating hours per year. Because these figures cannot be based on experience, he said, today's atomic power cost estimates are vague. They will remain so until more is learned about the reliability of atomic plant components.

Savings of some $14 million a year are possible by better-coordinated utility system operation in the Southeast, E. D. Early, Southern Services, Inc, said in presenting a report of the SEE Power Coordination Committee. Perhaps $10 million could be saved, he said, by a nominal investment in transmission facilities interconnecting various areas. Speaking for the committee he urged that individual systems study the savings possible through increasing the capacity of interconnections.

J. S. Macdonald, General Electric Co, introduced a new industrial motion picture titled "This Is Automation" devoted to the history, growth and future of automation. It is GE's latest release in the More Power for America Series.

What other SEE speakers said at three day-long symposiums on distribution, transmission and generation is summarized in following paragraphs:

Distribution

Burndown or damage to a bare conductor by an arcing fault usually results from the conductor being annealed by hot gases in a short section rather than melting away. This was among the results of Florida Power & Light Co tests reported by J. A. Lasseter. Presence of an insulator, tie wires, armor ribbon, or any other heat absorbing material reduces conductor

temperature rise and thus damage to the conductor, he said.

Utilities should take more active interest in code provisions to correct a conflict between the National Electrical Safety Code and National Electrical Code, M. L. Cathey, George Power Co, said. NEC has a 12-ft minimum clearance for service wires he noted, but the NESC permits 10 ft. The 12-ft minimum is proper because service drops 10-ft above driveways are often knocked down by vans and trucks, he said.

Use of pole extensions reduces replacements and, thus, costs, said R. L. Walker, Jr, Virginia Electric & Power Co. Moreover, they help conserve dwindling pole supply. Walker discussed six types of extensions that have proved successful. They are: A pole-top steel ridge pin, 2-ft high steel extension, 4-ft steel extension, wood crossarm extension, wood stub-pole top extension, and bottom stubbing of poles.

Because of the fault current problem a better way of time rating modern breakers is needed, said an absentee paper by Chase Hutchinson, Ebasco Services, Inc. Present time rating pertains to quite a range of currents and usually is the speed for the breaker to clear a low power-factor current of about 25% of the maximum.

This speed is meaningless in the fault current limitation problem, Hutchinson pointed out. The significant time is that in the 50-100% of interrupting capacity range. For this reason, he suggested engineers give adequate weight to speeds in this range when buying breakers.

Transmission

Galvanized tubular steel poles are being installed experimentally in a 5-mile section of 115 kv H-frame line by Florida Power Corp, C. B. Benham told the SEE transmission group. The company is also experimenting with concrete and fiberglass transmission poles to meet the growing shortage of southern yellow pine. Tubular poles are 75 ft long, are in two tapered sections, have Class 2 strength, but weigh 54% of the creosoted pine equivalent, he said. Estimated cost per mile of this construction was given as $25,866.

Comparison of mechanical and cost factors has led George Power Co to conclude that in some cases it is just as well to build a 110-kv line to serve a heavy load area as to build a large-conductor 44-kv line, Richard Wood said. A 110-kv spar-arm H-frame line with 336.4 MCM cable costs only about $1,000 more than a single-pole heavy conductor line at the lower voltage.

PROMINENT at meeting were R. Miles Cary, Virginia E&P; K. W. Haagensen, Allis-Chalmers; S. C. McMeekin, South Carolina E&G; and F. W. Argue, Stone & Webster

In the interest of substation simplicity and economy, Carolina Power & Light Co is using stone and timber foundations instead of concrete; strain buses to save structure, fittings, and labor; has discontinued use of conduit for control cable; is holding down of size of substation lots; and is changing over to aluminum. Details of these practices were explained by W. R. Buchanan and W. R. Hanchey.

A saving of 15% in the cost of a substation ground field is possible using all-galvanized steel ground field in high-resistance or alkaline soils, according to S. E. Hart, Alabama Power Co. But he warned that a galvanized steel ground field would be unreliable in low-resistance acid soils because of local electrolytic corrosion. Cathodic protection in such cases would make the cost excessive.

Use of an inert gas-arc welding process for the fabrication of aluminum bus at Harahan Substation of Louisiana Power & Light Co, in preference to cast and bolted fittings, saved an estimated $338, Morris Steiner said. Such construction eliminated connector and bolt breakage, gave a permanent connection, simplified stores handling, and cut construction costs.

Generation

Among the features contributing to the $130-135 per kw cost of South Carolina Electric & Gas Co's new 125,000-kw Silas C. McMeekin Station was low height of its 100,000-lb-per-hr boiler and the cross compound, axial exhaust turbine generator unit. Use of the latter reduced foundation cost, cut the crane span, kept condenser pit head room down, and in general contributed to a low compact station configuration.

Station cubage will be 15 cu ft per kw, and average plant reduction of height 65 ft was achieved compared to Urquhart No. 3. G. L. Dibble said cost appears to be $10/kw less. Heat rate of the station based on steam at 2,400 psi 1,050/1,000F will be less than 9,000 Btu per kwhr, he said.

J. H. Carter, GE, said that conventionally cooled generators should be used up to at least 160 Mw. Gas-conductor cooling may be justified between 160 and 200 Mw, but conventional designs are available in this range. Above 200 Mw liquid-cooling appears best. Today, he said, the generator designer can supply units for an 800-Mw cross-compound set.

Experiments at Florida Power & Light Co plants that use sea water in condensers has shown that where cathodic protection was applied, corrosion was stopped or reduced, J. B. Prime revealed. Two types of protection are used: galvanic and forced drainage—(graphite anodes with a rectifier). Criterion of choice has been area of water box. Where room was too small for magnesium anodes without impeding water flow, graphite anodes and rectifiers were necessary.

High-voltage dc generator testing is favored by Duke Power Co, according to M. F. Leftwitch and C. F. Bretholi, because:

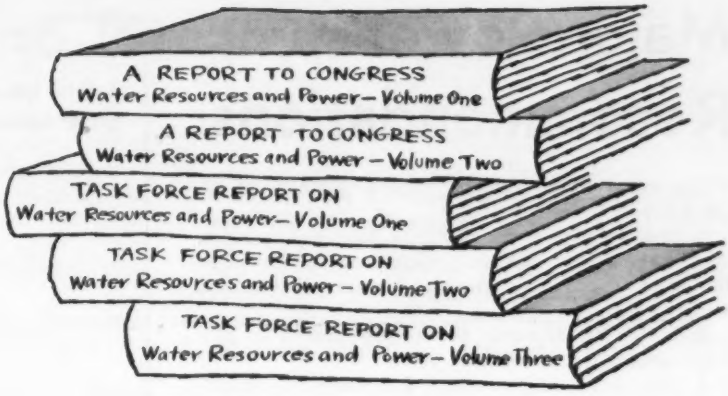
1. Controlled voltage and limited millamperage are non-destructive.

2. Dc tests are more searching and can give indication of insulation weakness.

3. Dielectric adsorption curves indicate condition of the insulation.

4. Dc tests help locate weakness elsewhere than in generator windings.

A Special Report:


A REPORT TO CONGRESS
Water Resources and Power – Volume One
A REPORT TO CONGRESS
Water Resources and Power – Volume Two
TASK FORCE REPORT ON
Water Resources and Power – Volume One
TASK FORCE REPORT ON
Water Resources and Power – Volume Two
TASK FORCE REPORT ON
Water Resources and Power – Volume Three

Hoover Commission Report on Power:

What Does It Offer?

- **Hoover report is aimed at increasing the efficiency of and bringing larger return on federal investment in power**
- **Several actions by the Administration and Congress appear to be in line with recommendations on federal power**

By tomorrow—May 15—President Eisenhower wants a full report from each government agency as to what it has done to implement the Hoover Commission recommendations.

Agencies administering federal power activities will be able to report several actions in line with the proposals. Progress has been made in standardizing cost allocations of multiple purpose projects and fixing more realistic power rates. Present Administration policies encourage local interests and private enterprise to assume a larger responsibility for hydroelectric development.

A similar report by Congress would show little. Although the Commission submitted 10½ proposals in the power field which require legislative action, not a single bill has been introduced to implement them. However, Congress has gone along with the Administration in cutting back power expenditures and permitting local interests to develop waterpower projects.

In its report submitted to Congress, the Hoover Commission indicates that its recommendations on water resources and power offer:

- Savings in government power operations and a larger return on the government's power investment.
- A better coordinated, more efficient organization for administering federal power activities.
- More equitable distribution of federally produced power.
- Less duplication of local efforts in the electric power field.

The Hoover Commission, officially the "Commission on Organization of the Executive Branch of the Government" was created by Congress July 10, 1953. It was directed to study the functions, programs, and policies of the executive branch and recommend ways of increasing efficiency and effecting economies. An earlier Hoover Commission created in 1947 did not have authority to study or recommend policy changes.

Of 314 recommendations, 15 dealt with water and power resources, and ten dealt directly with activities of the federal government in the power field.

What Does It Offer?

Major power recommendations ..... **Page 104**

What's behind the recommendations ..... **Page 105**

Faces stiff opposition ..... **Page 107**

They're pushing for acceptance ..... **Page 108**

Major Power Recommendations

• That the Congress adopt a national water policy on the following points:

1. That water resources should be developed to assure their optimum use and their maximum contribution to the national economic growth, strength, and general welfare.

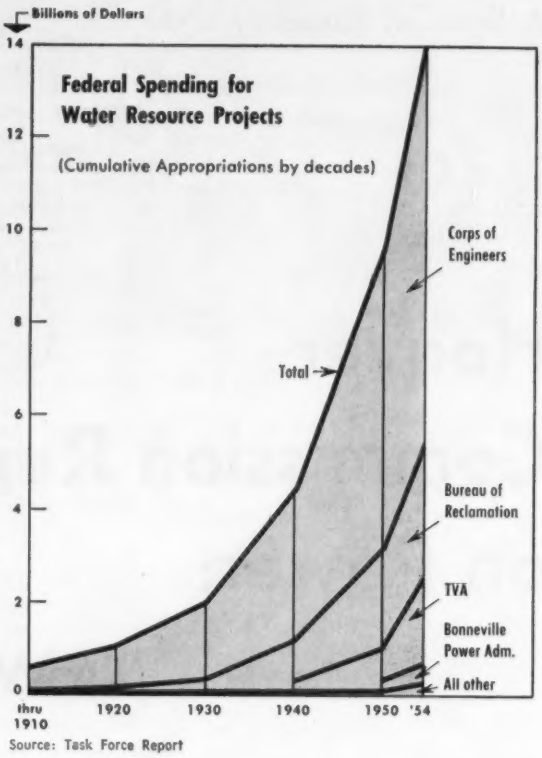
2. That water resources development should be generally undertaken by drainage areas.

3. That the federal government should assume responsibility when participation or initiative is necessary to further or safeguard the national interest or to accomplish national objectives where projects, because of size or complexity or potential multiple purposes or benefits, are beyond the means or needs of local or private enterprise.

4. That before Congress authorizes or appropriates funds for federal participation in any water resource project, it should have substantial evidence that the project is economically justified and financially feasible, and essential to the national interest.

5. That all federal agencies administering revenue-producing water resources and power projects should pay all cash revenues to the Treasury as miscellaneous receipts and receive an annual appropriation for cash operating expenditures.

Status: No legislative action has been taken by Congress.



Source: Task Force Report

• That, without going into details, we recommend the creation of a Water Resources Board.

Status: An advisory committee of Cabinet members has made a similar proposal to the President.

• That the Budget Bureau staff be strengthened to enable it to perform fully the functions of evaluation of the merits of water development projects presented to it for funds.

Status: No action.

• That Congress empower and direct the Federal Power Commission to fix the rates on government power sales at such levels as will—

1. Eliminate the inequities now imposed upon the great majority of the people.

2. Amortize and pay interest on the federal investment in power, plus an amount which will equal federal tax exemption based upon the federal taxes paid by the private utilities.

3. Provide payments in lieu of full taxes to the state and local governments.

Status: The Administration is pressing for more realistic power rates for Southwestern Power Administration.

• That the government or its agencies cease the building of steam plants and provide for the equation of their power loads by interconnection with neighboring systems.

Status: No action.

• That the private utilities be permitted to purchase a fair share of federal power and that no further building of transmission lines be undertaken where service can be provided by non-federal agencies.

Status: Administration has generally leaned toward non-federal transmission of power where possible.

• That federal agencies now producing and marketing power all be incorporated under and made subject to the Government Corporation Control Act.

Status: No action.

• That federal power projects be required to secure their capital for future improvements, when authorized by Congress, by issuing their own securities to the public without subordinating the present federal investment.

Status: TVA has submitted proposed legislation to Congress for revenue bond financing, but it does not meet the criteria of the Hoover Commission.

• In respect to the power component of new multiple-purpose projects, we make these recommendations:

1. That private enterprise be offered the opportunity to provide the capital for the electrical component of the projects and dispose of the power through their own systems. The management of the dams should remain in the federal government.

2. That if such capital be not available, the power should be offered for sale to the private utilities, the states, or the municipalities and cooperatives prior to construction, on terms that will protect the federal interest.

Status: No specific action, but the Administration's partnership policy seems to be generally in line with a part of this recommendation.

Reasons Behind Recommendations

Need for Congressional Water-Power Policy. Congress has been grinding out legislation dealing with electric power generation, transmission, and distribution since 1906. There have been at least ten major acts passed and scores of provisions, riders, and amendments written into other legislation. Through all of this, there is no consistent, integrated policy for power development or for marketing power from federal projects.

In its report to Congress, the Hoover Commission pointed out these inconsistencies and conflicts in policies and actions:

- Differences in the criteria used in estimating benefits from and in justifying various federal projects.
- Differences in interest rates charged against federal projects for capital invested by the federal government.
- Different methods between projects for determination of power rates.
- Inclusion of interest on capital during construction in the cost of some projects and not in others.
- Inclusion of supervisory expenditures during construction in the cost of some projects and not in others.
- Differences in allocating costs to power components of multiple purpose projects.

Although integrated in actual construction, the policies surrounding the various components of a multiple purpose project seem to have grown separately. Even the separate policies show little sign of coherence. For instance there are at least six different versions of the preference clause under which federal power is sold. They contain different language and are found in different acts. Each of these has a different legislative history. They are administered by no less than six different federal agencies.

The need for an overall national policy for water resources development has been urged by at least two Presidential advisory groups, one in 1950 the other late last year. It has been voiced by various members of Congress, several national organizations, and many writers.

Creation of a Water Resources Board. The Commission proposed that a Water Resources Board be set up to determine the broad policies for recommendation to the President and, with his approval, to Congress. The board would also have the duty to devise methods of coordinating plans and actions of the various federal agencies dealing in water resources development.

It was suggested that this group be made up of Cabinet members appointed by the President and five public members. It would be headed by a non-government man.

There is a long history of attempts to secure better organization both at the top level of the government and in the field. The first Hoover Commission in 1949 recommended creation of a similar review board.

In May 1954 President Eisenhower appointed three Cabinet members, Agriculture Secretary Ezra Taft Benson, Defense Secretary Charles E. Wilson, and Interior Secretary Douglas McKay, to a Committee on Water Resources Policy. In its report released in December 1955 this group recommended that a coordinator of water resources be appointed to provide agency coordination and establish standards and principles for planning and development of water resources projects.

The Cabinet members also proposed creation of an independent board of review to analyze the engineering and economic feasibility of projects for the coordinator.

Neither of these proposals has yet been implemented by the President or by Congress.

It is evident that both the Hoover Commission and the Cabinet committee sought to avoid abolition or subordination of any existing agencies dealing in power and water resources development. Each of these agencies has strong political support in Congress.

Strengthen Budget Bureau Staff. The only coordination of power development afforded the executive department is through its budgeting activity. All the federal agencies dealing in power development or power marketing must clear their budgets through the Bureau. Now as in the past this staff is small and not adequately equipped to pass on the merits of the projects presented to it for appropriations. The other agencies have a distinct advantage by reason of larger staffs and superior knowledge of the projects. They present the affirmative case before the Bureau staff. No one presents the negative case.

A House subcommittee headed by Rep Robert E. Jones (D-Ala.) concluded in 1952, "Possibly the staff of the Bureau of the Budget should be strengthened in order properly to carry out this responsibility. But this is a matter for the Chief Executive to determine and, if he sees fit, to request necessary funds for such strengthening."

Rates for Federal Power Projects. The Hoover Commission Task Force estimated that tax exemptions and other uneconomical rate-making practices caused revenues from

Federal Agencies in Power

Army Corps of Engineers

Bureau of Reclamation

Tennessee Valley Authority

Bonneville Power Administration

Southwestern Power Administration

Southeastern Power Administration

Rural Electrification Administration

Federal Power Commission

Atomic Energy Commission

International Boundary and Water Commission, U. S. and Mexico

International Joint Commission, U. S. and Canada

Bureau of Indian Affairs

federal power sales in 1953 to fall about 40% below the value of the power.

When measured against its criteria for determining financial results, the Task Force found federal power agencies showed a deficiency of $75.6 million for fiscal 1953 alone. The cumulative deficiency for all federal power operations would be $333.5 million according to the Task Force Report.

Criteria set up for determining the financial results were:

- That the federal government should receive 3% interest annually on its investment in power projects.
- That investment should be amortized in annual installments in not more than 50 years for hydroelectric plants and 35 years for steam plants.
- That capital costs of each project should include all such costs as preliminary investigation, design, acquisition of land and water rights, relocation of facilities, and supervision and interest on capital during construction.
- That annual provision should be made for replacement of plants during the amortization period.
- That projects should pay local taxes equal to those of privately owned electric utilities.
- That the earnings of the federal projects should include an amount equal to the federal tax exemptions, based on the tax payments of private utilities.

There is no single policy for setting rates on federally produced power. Federal Power Commission approval is necessary for rate schedules of the Southeastern and Southwestern Power Administrations. TVA makes its rates without reference to any regulatory body. The same applies to the Reclamation Bureau except for power it markets from Army Corps of Engineer projects.

Cease Building Steam Plants. TVA was originally established as a water resources development and control project. Its present plans call for steam plant generation three times the capacity of its hydroelectric projects. The Commission sees no reason for considering thermal generation essential for water resource development. Instead it suggests that peaking power from government projects can be more economically utilized through interconnections with existing electrical systems.

Federally Generated Power Be Equitably Distributed. The Commission Task Force found that preference given public and cooperative bodies in purchase of federal power had led to construction of uneconomical transmission lines and the sale of power at less than production costs. It further found that such preference resulted in serious inequities and discrimination between the citizens of various states.

The Task Force asserted that federal transmission lines had been built in areas already served by existing lines. It saw no need for the duplication.

Power Agencies Be Subject to Government Corporations Control Act. Because the various power marketing agencies are, in a sense, business enterprises, the Commission feels they should be required to keep business records. This is a requirement of the Government Corporations Control Act. Congress would retain control over major expansion projects and act as a sort of board of directors for agencies covered by the act. The Tennessee Valley Authority is already covered.

Revenue bond financing. President Eisenhower has recommended that the Tennessee Valley Authority secure its future financing by issuing its own securities to the public. The Hoover Commission would apply this proposal to other power agencies. However, it would not permit the agencies to use present federal investment as collateral for their securities. Adoption of this proposal would call for several changes in the legislative policy proposed by the Commission.

Private Enterprise Build Power Components of Federal Projects. The Task Force found that private enterprise is able to amass sufficient capital to build power plants in most water resources projects. It saw no need and no reason for the federal financing of power activities.

In cases where private capital is not available, the Commission would have the government build the plant and contract sale of the power prior to construction on terms that would protect the federal investment. Hoover Dam was constructed on this basis.

Members of the Hoover Commission

Herbert Hoover, Chairman

Herbert Brownell, Jr.
Attorney General

James A. Farley
Former Postmaster General

Arthur S. Flemming
Director, Office of Defense Mobilization

Styles Bridges
Republican Senator, New Hampshire

John L. McClellan
Democratic Senator, Arkansas

Robert G. Storey
Dean, Law School, Southern Methodist Univ.

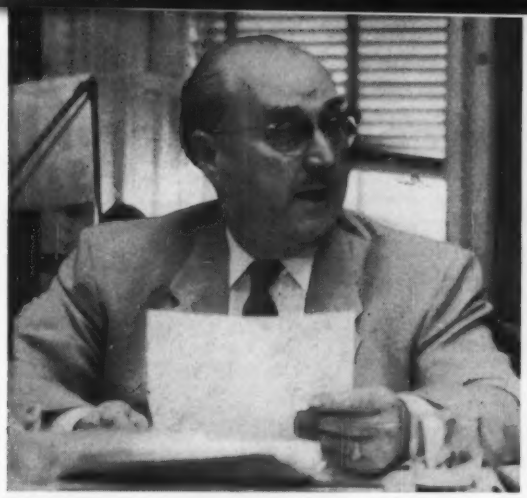
Clarence J. Brown
Republican Congressman, Ohio

Chet Holifield
Democratic Congressman, California

Joseph P. Kennedy
Former Ambassador to Great Britain

Sidney A. Mitchell
Banker, Government positions

Solomon C. Hollister
Dean, College of Engineering, Cornell Univ.



FILES DISSENT. Rep Chet Holifield, a Commission member, took issue with every major recommendation of power report

JONES COMMITTEE hears F. A. Pitkin, left. Others are Reps. Henry Reuss, Robert E. Jones, and Leonard Lipscomb

Faces Tough Opposition

- **Reaction to power report sharply critical. House subcommittee expected to hit hard in forthcoming study**
- **Dissents by Task Force and Commission members are in the original reports. Holifield filed long dissent**

Of the 15 proposals made by the Hoover Commission in the water resources and power field, at least 10½ face considerable opposition. Three others face sporadic opposition, and only 1½ appear to be drawing general support. This appraisal by the Citizens Committee on the Hoover Report is based on reaction of government officials and a study of public reaction in the form of newspaper editorials and news stories.

Congressional reaction to the water resources and power recommendations has been relatively sparse, but critical. A House subcommittee headed by Robert E. Jones (D-Ala.) is working on a report expected to hit hard at most of the recommendations. This group conducted hearings in 15 cities late last year and heard a number of opposition witnesses (EW, Nov. 28, 1955, p 58).

Sniping at the Hoover power study began even before work had gotten underway. The American Public Power Association and others protested that they were not adequately represented on the Task Force. The Commission turned down a proposal to expand it but did direct that public hearing be held by the Task Force.

Advocates of federal power expansion aired their views at a series of hearings held in May and June of 1954 (EW, Aug. 16, 1954, p 16). Spokesmen for electric companies and private enterprise also had their say. From these hearings, from extensive interviews with people in government, and from intensive studies, the Task Force submitted its report. In this there were several dissents, the strongest coming from Harry E. Polk, North Dakota publisher and former president of the National Reclamation Association.

Among other things, Polk protested that any changes in "preference clauses" would do harm to the rural electrification program. He also urged that the federal government continue its financial assistance to irrigation projects. Both Polk and H. W. Morrison, top official of the Morrison-Knudsen Co, questioned the advisability of a Water Resources Board to coordinate all federal activities relating to water resources.

Strongest indictment of the final Hoover power report came in a dissent filed by Representative Chet Holifield (D-Calif.). This dissent, nearly as long as the full report, took issue with many of the major points of the report. Holifield's charges relating to power were:

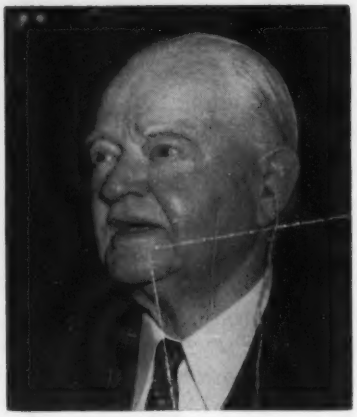
- The Commission exceeded its jurisdiction by attempting to prescribe policies for Congress.
- The Commission report was based on the Task Force investigations, and these contained unwarranted findings, inconsistent conclusions, and prejudiced recommendations.
- Although the Commission lists numerous instances of duplication and overlapping in water resources activities, it offers no valid plan for organization which would eliminate this waste. He found the proposal for a Water Resources Board an "unwieldy superstructure (which) would be piled on top of existing agencies."
- The power recommendations would destroy present benefits of low-cost federal power development and leave future development in the main to private interests. The proposals include heavy increases in federal power rates; a halt to construction of government-owned steam plants and transmission lines; elimination of the 50-year-old "preference" rights of municipal, cooperative, and other local nonprofit distributors of power; and transferring the power component of new multipurpose dams to private utilities.
- The problems of nuclear power development are ignored entirely.

Commissioners Herbert Brownell, Jr, and Arthur S. Flemming registered dissents to part of the report on the grounds it would "impede the federal government from exercising its proper role." Commissioner James A. Farley dissented for a similar reason.

They're Pushing for Acceptance

ADM BEN MOREELL:
"It is my firm intention to do all in my power to mobilize effective public support for those recommendations with which I agree."

HERBERT HOOVER:
"I am confident that the pressure of American common sense will secure 70% of our recommendations in the next five years."



The real drive to implement the power recommendations is still ahead. Close observers see little chance of serious legislative consideration during this election year. The strategy is to wait until Congress has more time to devote to the proposals.

Meanwhile the emphasis is on gaining public understanding and support for the proposals. This is being tackled through public speeches, news stories, pamphlets, and even a full-length book on the Hoover report. The Citizens Committee for the Hoover Report, organized specifically to gain acceptance of the recommendations, reports considerable progress on the report as a whole but little progress on recommendations dealing with power activities.

Adm Ben Moreell, who headed the Water Resources and Power Task Force, has been most active in carrying this story to the public. Through addresses before numerous interested groups and through magazine articles, Moreell has done much to lay the basis for changes in federal power policy. Moreell notes that the Commission did not fully accept the studies and recommendations of his Task Force. However, he says, "I am sure that the total of the Hoover Commission recommendations, if made effective, would constitute a great advantage to the nation."

Commission Chairman Herbert Hoover is devoting a large share of his time to gaining acceptance for the recommendations. He has helped in providing material and in serving as spokesman for the report. He has testified before Congress and is preparing for more appearances.

The Citizens Committee is organizing the educational campaign now in progress and keeping close tabs on the actual progress of implementing the reports. Two of its staff members, Neil McNeil and Harold Metz, recently published a book explaining and providing considerable background on the report. The Committee has issued numerous pamphlets and studies on implementation of the report.

In a recent public statement, Committee Chairman Clarence Francis reported that 22% of the Commission recommendations have been adopted which will ultimately save the government some $470 million a year. But not a single one of these has been in the power field.

Objectives of Hoover Commission

- **To preserve the full security of the nation in a disturbed world.**
- **To maintain the functioning of all necessary agencies which make for the common welfare.**
- **To stimulate the fundamental research upon which national security and progress are based.**
- **To improve the efficiency and eliminate waste in executive agencies.**
- **To eliminate or reduce government competition with private enterprise.**
- **And perhaps the most important of all, to strengthen the economic, social, and governmental structure which has brought us, now for 166 years, constant blessings and progress.**

—Final Report to Congress

High-Voltage Dc Tests Presage Surge Failure of 40-Kv Condenser Bushings

	90-Kv DC Test		Power Factor and Capacity Measurements					Surge Tests	
	Amp	Megohms	Power Factor		Capacity		Rejected for	Three 200-kv 1.5 x 40 waves	Six 380-kv Waves
			Test	Limit	Test	Limit			
Group 1—Over 2 μ amp leakage									
1.	50	1,800	2.26	2.4	253	197	High cap	Internal breakdown 1st test	————
2.	20	4,500	1.5	2.4	210	224	OK	Withstood OK	Internal breakdown 4th test
3.	14.7	6,100	4.67	2.5	182	198	High pf	" "	" " 6th test
4.	13.2	6,800	4.3	2.5	236	221	High pf High cap	" "	" " 1st test
5.	3	30,000	2.55	2.4	224	197	High pf High cap	" "	" " 1st test
6.	2.4	37,000	2.3	2.4	248	224	High cap	" "	" " at 124 kv 60 cps
Group 2—About 1 μ amp leakage									
7.	1.0	90,000	2.9	2.4	205	197	High pf High cap	" "	" " 4th test
8.	1.0	90,000	4.0	2.5	197	198	High pf	" "	External flashovers
Group 3—Under 1 μ amp leakage									
9.	0	Infinite	1.1	2.4	206	197	High cap	" "	External flashovers
10.	0	Infinite	0.94	2.4	206	197	High cap	" "	" "
11.	0.3	270,000	1.1	2.4	262	224	High cap	" "	" "
12.	0.1	900,000	6.3	2.5	291	304	High pf	" "	Long porcelain prevented flashover at 380 kv.

Test Bushings with High-Voltage DC

SUBSTATIONS
Testing

- **Leakage current reveals insulation strength**
- **Surge tests demonstrate accuracy of results**

H. R. HARRIS and F. P. RHINE, Electrical Engineers, Detroit Edison Co, Detroit, Mich.

Surge tests on twelve 40-kv condenser-type bushings following high-voltage dc, power factor, and capacity tests have demonstrated the accuracy and effectiveness of high-voltage dc testing. The bushings were selected, with one exception, because they had been rejected for high power factor, high capacity, or both.

Analysis of the data showed:

1. Bushings with less than 0.5 μ amp leakage at 90 kv had sufficient insulation strength to withstand all surge tests.

2. Bushings with more than 2 μ amp leakage at 90 kv were weak. Internal breakdown occurred in all six of the bushings in this group. Five breakdowns occurred during surge tests and one during 60-cps over-voltage tests.

3. High-voltage dc measurement will show whether the bushing dielectric is capable of withstanding surge proof tests. It appears to offer significant advantages over conventional methods of testing.

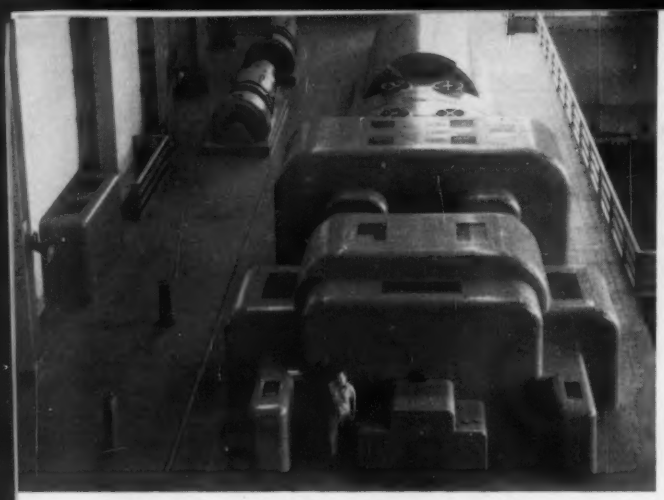
The test results have been tabulated in three groups according to leakage current measured at 90 kv. Group 1 includes six bushings with more than 2 μ amp. Group 2 gives data for two bushings with 1 μ amp. Group 3 includes four bushings with less than 0.5 μ amp.

This grouping shows that bushings with more than 2 μ amp leakage have low dielectric strength. Bushings with 1 μ amp leakage are in the questionable zone. Bushings with less than 0.5 μ amp leakage have high dielectric strength.

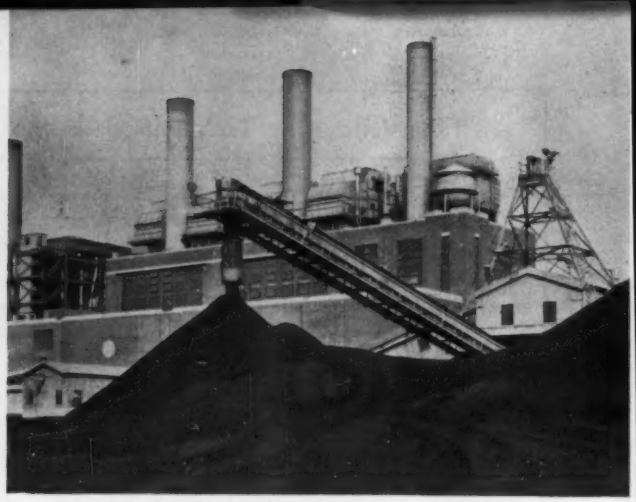
Ten of the 12 bushings came in from the routine breaker reconditioning schedule. Of the remaining two, one was removed from service because of a low reading on standard insulation test and the other because of a compound leak at the flange.

All six bushings of Group 1, with leakage currents over two μ amp, failed internally in the surge tests, except one which failed on 60-cps over-voltage.

(*Continued on page* 203)



TURBINE-GENERATOR operates at 2,350 psig, 1,100F at throttle, 1,050F reheat temperature. Rotor is inner-cooled by hydrogen flowing in conductors



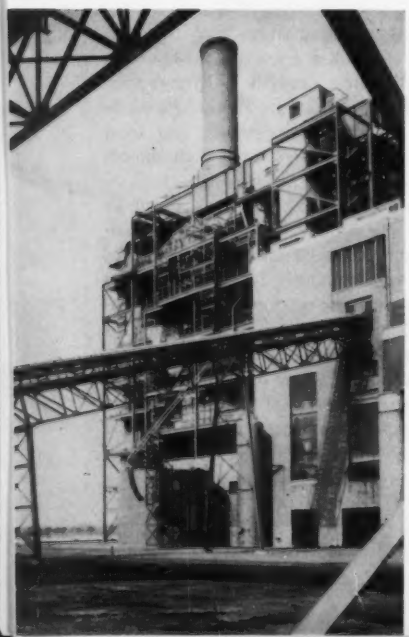
COAL-HANDLING SYSTEM embodies an active outdoor bunker pile. The swing-boom conveyor deposits some 25,000 tons in 60-ft-high kidney-shaped pile

Burlington Station Is Generating

GENERATION
Design

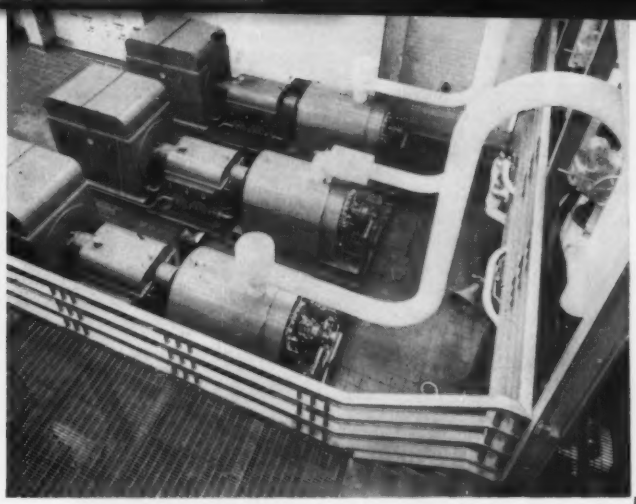
200,000-kw steam turbine-generator unit has highest steam temperature for U. S. generation, essentially outdoor boilers

COAL goes from the 4,500-ton active pile to any one or all of the five 50-ton silos, each feeding a coal pulverizer. There are 20 coal and 20 oil burners



Vital Statistics Burlington's New Unit

Boiler	
Type	Natural circulation—Pressurized furnace—Reheat
Capacity	1,225,000 lb per hr continuous
Design	2,700 psig; 2,389 psig at superheater outlet 1,100F main steam, 1,050F reheat steam
Efficiency	91.17%
Turbine-Generator Unit	
Type	Tandem compound, 3,600 rpm, reheat, condensing, triple exhaust
Capacity	200-Mw turbine; main generator 192 Mw at .85 pf, 13.8 kv, 45-psig hydrogen pressure, direct conductor cooling of field coils.
Design	2,350 psig, 1,100F main steam, 1,050F reheat, 1½ in. Hg absolute, 8 stages of extraction
Major Electrical Equipment	
	2 Main power transformers
Rating	130,000 kva, 138 grd Y—13.8 kv, 3 phase
Type	FOA
	1 Auxiliary power transformer
Rating	9,000 kva, 27.72—4.37 grd Y,
Type	OA/FA
	Auxiliary power switchgear
Type	5 kv, indoor, metalclad 440 and 220-v indoor power centers

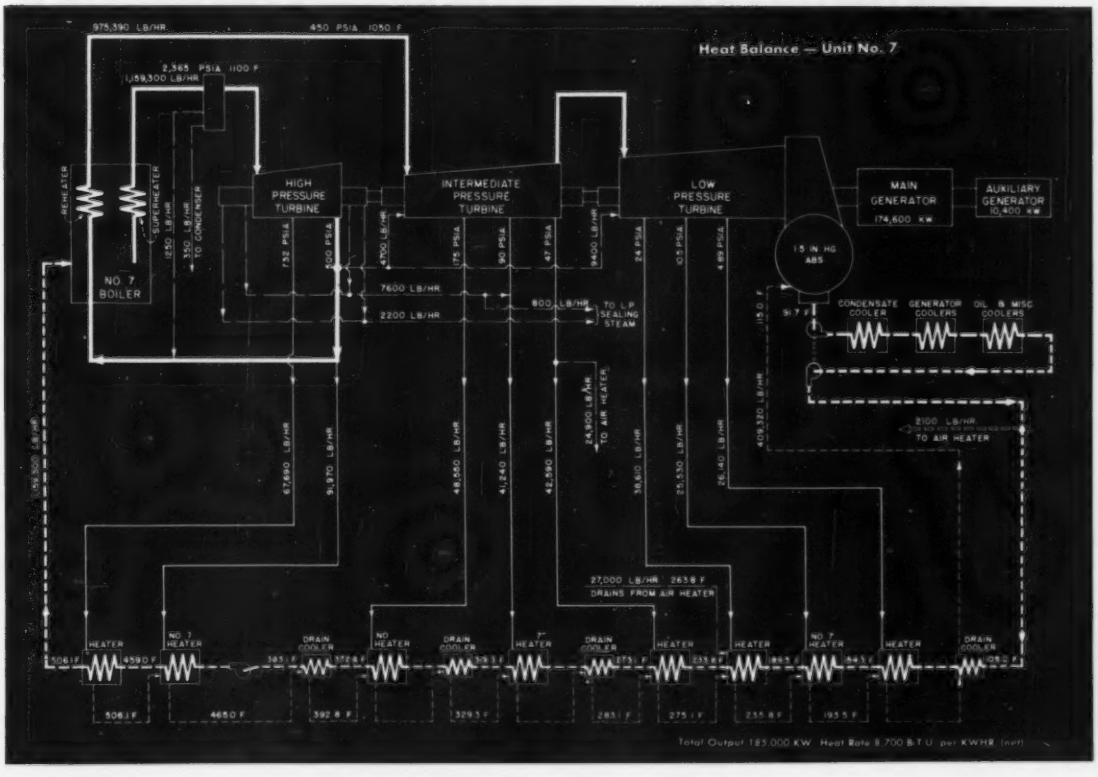


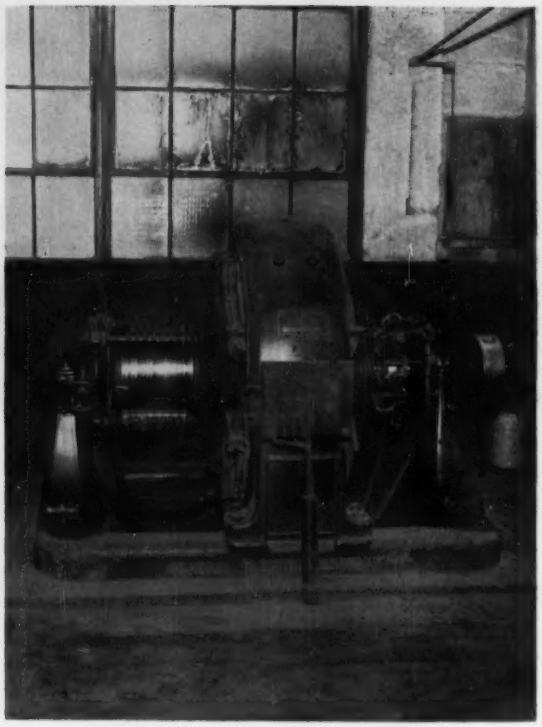
BOILER-FEED and condensate pumps are paired electrically to operate through the same breaker from the same switch. Pairs start and stop together

ALL CONTROLS are in a single, soundproofed, air-conditioned room where the miniature panel components are arranged compactly in a curved console. From his regular station, the operator sees only instruments for operating plant. Instruments for recording only are in the wings of the control room

Milestone

FEEDWATER CYCLE includes eight heating stages with six heaters and four drain coolers on the suction side of boiler feed pumps. Whole system, from superheater outlet to first-stage turbine nozzle, is austenitic stainless steel, chromium-nickel, columbium stabilized





OUT WITH THE OLD—E. J. Drewelow pulls switch killing old dc converters

Joplin Drops Converter Substation,

J. T. JONES, Assistant General Manager, Empire District Electric Co, Joplin, Mo.

Direct-current service to elevators in Joplin, Mo., is a thing of the past. Advanced engineering technology has spurred Empire District Electric Co to turn to ac-powered selenium rectifiers as a practical, money-saving answer. Now Joplin's elevators are moving up and down as well as ever, and both the utility and its customers have solved a knotty problem.

Implications of Empire's experience may have a far-reaching impact upon other utilities. It means that utilities serving direct-current elevator loads now can shed their burdensome dc systems. In Empire's case, a 45-year-old synchronous converter substation was shut down and the 25-cycle transmission line supplying it was converted to serve metropolitan Joplin with 60-cycle power.

For 45 years, Empire maintained a dc service for Joplin. Company officials wanted to eliminate this system anachronism. Vice-President and General Manager Earl J. Drewelow asked the commercial and general engineering departments to evaluate selenium rectifiers for use with elevators.

The engineers decided that rectifiers could do the job. Subsequently one elevator was equipped experimentally with a rectifier. It worked properly. Even when fully loaded, the elevator accelerated and braked normally. Testing engineers were convinced then that selenium rectifiers offered Empire a way of getting rid of its dc.

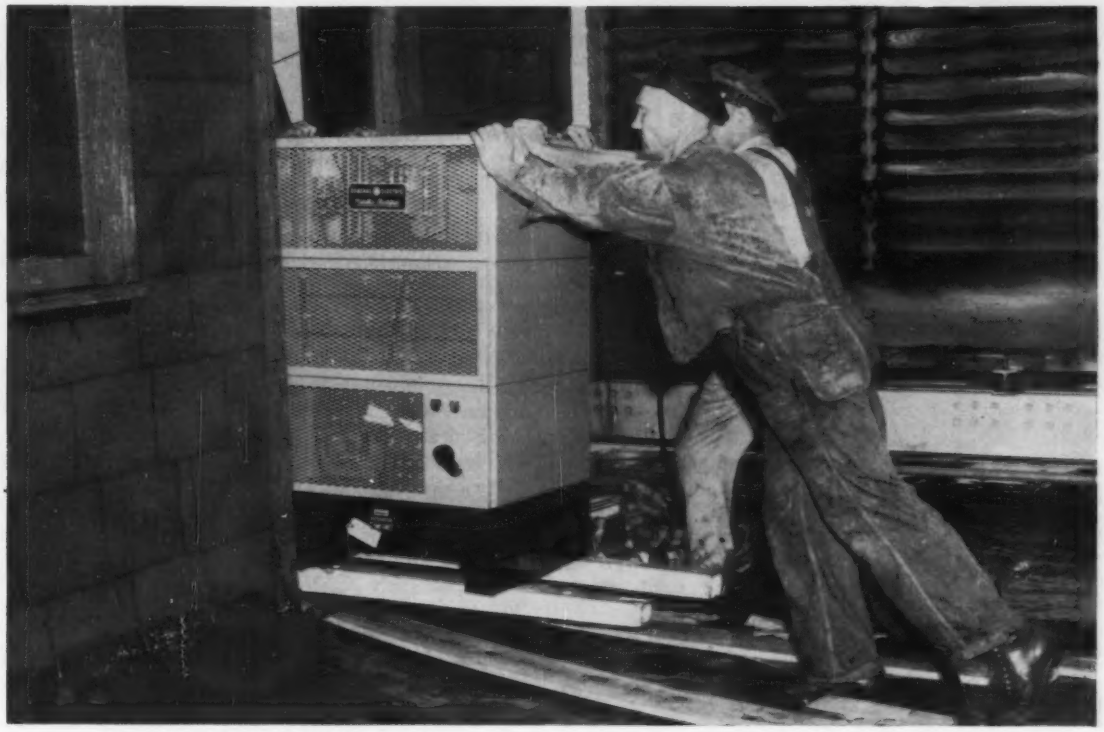
At that time Empire supplied direct current power from a synchronous converter substation in downtown Joplin. This substation housed two 250-kw dc generators, each driven by a 290-hp, 2,400-v, 25-cps motor. Served by a 2,400-v, 3-phase, 25-cycle transmission line, this converter station was the line's only load.

With elimination of the dc network, it became possible to convert this transmission line to a new 60-cycle supply for the metropolitan area.

After the commercial and general engineering departments decided that rectifiers could power dc elevators, an order was placed for one 25-kw rectifier with a dynamic braking panel. It was to be installed in a large department store where two identical elevators ran side by side. One had been converted to ac, but the other still required dc.

The experimental installation was so successful that the author surveyed the remaining 12 dc customers. With help of engineers of a manufacturer, equipment was selected to serve 22 elevators operated by these customers. The cost estimate of equipment required, based upon a plan that was developed, was only 33% the estimated cost of replacing dc elevator drive equipment with ac equipment.

Empire subsequently approved an expenditure of $50,640 for conversions. Some customer participation in the costs, in the form of a contract which the customer signed (described later in this article), reduced Empire's



IN WITH THE NEW—Selenium rectifiers were easy to install because of size

Turns to Rectifiers for Dc Service

gross cash outlay to $43,650. The anticipated benefits justified this expense, it was felt.

Estimates pointed to the fact that customers would enjoy a substantial saving by getting all power through the main ac meters. These savings, of course, depended upon existing load factors, length of time of elevator usage, and the number of elevators involved. Studies showed that some customers might save nothing, but the largest customer should save as much as $750 a year.

The author developed a plan in which Empire would bear the total cost of installing and adjusting the rectifier equipment. A bill of sale was prepared in which the customer agreed to buy the rectifier equipment for a fixed sum. This amount would equal the customer's estimated savings in power costs over a 5-year period. No down payment was required, and the customer's monthly payments equalled his monthly savings.

Therefore the customer who saved the most paid the most, and the customer who saved nothing paid only $1 a month. In no case did the customer pay more per month than he had been paying; and after the 5-year period expires, his savings will accrue.

Thus Empire was able to establish a fair basis for participation with its customers in adapting elevators to ac. Empire agreed either to install the rectifier or to give the customer an equivalent amount of cash for applying toward new ac equipment. The customer did, however, assume responsibility for maintaining the rectifiers. Because the life of selenium cells is about 15 years, the customer should enjoy a substantial saving—maintenance considered—before replacement stacks are needed.

It took about eight months to negotiate contracts with the 12 customers. Many had to seek contract approval from their home offices. By February 1955 all had signed agreements on one basis or another.

After agreements were completed, equipment was ordered; and necessary wiring on the customer's premises was contracted. Rectifier installations ranged from 12.5 to 62.5 kw. A total of 237.5 kw in selenium rectifiers was installed in the complete conversion.

Where practical, rectifiers were set next to old dc meters so they could feed directly into old dc main entrance switches. Generally this helped cut wiring costs. Some installations were made in elevator penthouses, and some were made in basements. But in all cases, the lightness, sturdiness, and compactness of the rectifiers made it easy to place them where desired.

All equipment is now in. Empire has obtained a spare set of selenium rectifier stacks to guarantee immediate availability in Joplin should replacement cells be necessary.

This conversion was completed with no customer complaints. Empire's public relations, if anything, were improved during negotiations, and both the company and its customers now are benefiting from the conversion.

New Units for Old Plants: When

GENERATION
Planning

Study of Fisk Station by Commonwealth Edison shows early replacement to meet rising load affords $1-million savings

J. E. BROWNLEE, Staff Mathematician, and
J. C. FOSS, Engineer, Commonwealth Edison Co, Chicago, Ill.

Commonwealth Edison Co, facing the problem of meeting a continually increasing load which is expected to double in the next decade, must not only develop new generating sites, as do most utilities, but must expand existing ones near load centers. Maximum utilization of existing sites grows more important as new sites become difficult to obtain within economic transmission distance of load centers.

Commonwealth Edison recently completed a study of Fisk Station which first went into commercial operation in 1903. This study weighed the economics of replacing certain older generating units with new equipment to develop the site to its ultimate capacity.

Fisk Station is in the heart of the company's central load area. An additional unit installed there would meet the 1958 load requirements, make most effective use of present transmission facilities, and cost less transmission plant investment than other available sites.

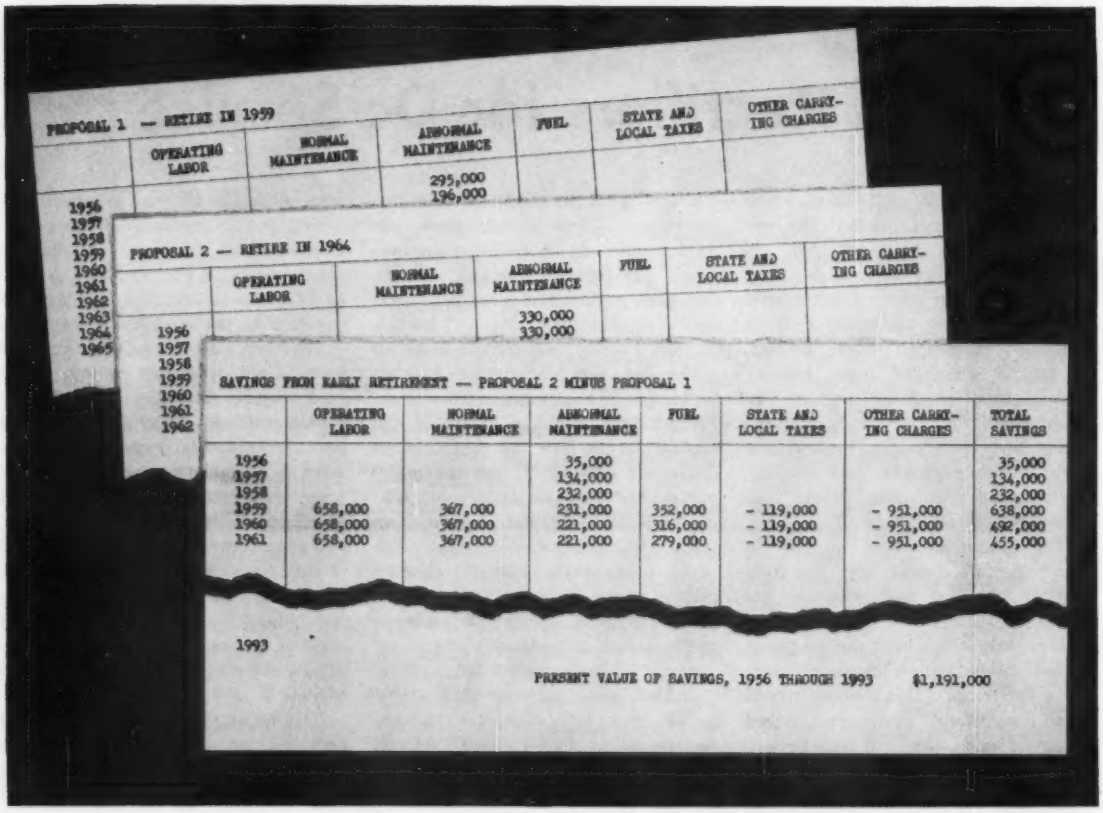
Two Areas Studied

To take advantage of higher efficiencies and operating economies, installation of a large unit was preferred. But such an addition to the present station would not be practicable where older equipment uses a disproportionate amount of the available cooling water. Retirement of the old equipment, with its high operating and maintenance costs, would permit an increase in station capacity through more efficient use of available cooling water and would reduce overall production costs.

Thus the study covered two areas:

1. An engineering study for the installation of the new unit.

2. An economic study to determine which, if any, of



PROPOSAL 1 — RETIRE IN 1959

	OPERATING LABOR	NORMAL MAINTENANCE	ABNORMAL MAINTENANCE	FUEL	STATE AND LOCAL TAXES	OTHER CARRYING CHARGES
1956			295,000			
1957			196,000			
1958						
1959						
1960						
1961						
1962						
1963						
1964						
1965						

PROPOSAL 2 — RETIRE IN 1964

	OPERATING LABOR	NORMAL MAINTENANCE	ABNORMAL MAINTENANCE	FUEL	STATE AND LOCAL TAXES	OTHER CARRYING CHARGES
1956			330,000			
1957			330,000			
1958						
1959						
1960						
1961						
1962						

SAVINGS FROM EARLY RETIREMENT — PROPOSAL 2 MINUS PROPOSAL 1

	OPERATING LABOR	NORMAL MAINTENANCE	ABNORMAL MAINTENANCE	FUEL	STATE AND LOCAL TAXES	OTHER CARRYING CHARGES	TOTAL SAVINGS
1956			35,000				35,000
1957			134,000				134,000
1958			232,000				232,000
1959	658,000	367,000	231,000	352,000	- 119,000	- 951,000	638,000
1960	658,000	367,000	221,000	316,000	- 119,000	- 951,000	492,000
1961	658,000	367,000	221,000	279,000	- 119,000	- 951,000	455,000
1993							

PRESENT VALUE OF SAVINGS, 1956 THROUGH 1993 $1,191,000

ECONOMIC STUDIES took into consideration those costs which differ between the two plans developed. The method of calculation employed level premium carrying charges, and the results obtained were checked by other methods

Do They Pay?

FISK STATION generating units, which were installed in 1903, are scheduled for retirement in 1959 as the result of engineering and economic studies. Replacement will be made for meeting load expected to double in ten years.

the station's older units could be profitably retired.

The older part of Fisk Station consists of three vertical low-pressure turbines, installed in 1909, on a common steam header with four low-pressure horizontal turbines set up between 1914 and 1920. Steam for these units is supplied by sixteen 70,000-lb-per-hr, 200-psig boilers and the exhaust from a 1937 high-pressure topping unit.

The topping unit gets steam from two 350,000-lb-per-hr high-pressure boilers. The exhaust from the topping unit can supply the steam requirements of any two of the low-pressure horizontal units. Total net winter capability of this part of the station is 145,000 kw.

Remainder of the station is a 147,000-kw high-pressure unit and a 150,000-kw high-pressure unit, respectively installed in 1943 and 1949. Each is supplied by two 750,000-lb-per-hr boilers connected to a common steam header.

For the study the station was considered as composed of three plants:

1. The high-pressure plant, Units 17 and 18.

2. The high-pressure topping unit, Unit 15, with two associated low-pressure horizontal units, all referred to as "Unit 15 plant."

3. The remaining low-pressure turbines with 16 low-pressure boilers, all referred to as the "low-pressure plant."

A necessary step was determination of the actual net summer and winter ratings of each unit when used in various operating combinations with other units in the station. Thus the effect on station capability of replacing any one or combination of units was established.

Plans Developed and Compared

The engineering study produced two plans for the installation of a 300,000-kw unit.

Plan A provides for installation of the new unit at the south end of the present station in the area occupied by the low-pressure and Unit 15 plants.

Plan B envisions installation of the new unit at the north end where the three vertical units are situated.

Plan B, requiring a building extension, is estimated to be slightly more costly.

Two factors affecting selection of the plan were changes in station capability during and after the construction period of the new unit, and the manpower adjustments involved.

Plan A specifies immediate removal of the low-pressure and Unit 15 plants to make space for the new unit. Such removal would decrease station capability during a period when it cannot be spared. Plan B preserves all station capacity except that of the three vertical units. When the new unit is placed in service, the low-pressure plant can be retired and the Unit 15 plant either retired or retained as conditions then dictate.

Plan A results in a large, immediate reduction in manpower needs because all old equipment must be removed before construction starts. In about three years, manpower requirements would be increased for the operation of the new unit. Plan B, by allowing all equipment except the three verticals to remain in service until the new unit is in operation, permits an orderly manpower reduction over the entire construction period.

On the basis of the above considerations, Commonwealth Edison decided on Plan B as the subject of an economic study.

As equipment ages, it becomes increasingly less competitive with new equipment. This happens not only because of its own deterioration but also because of the year-by-year improvement in new equipment. Thus operating savings available through replacement increase as the plant grows older. When operating savings which may reasonably be anticipated become greater than the carrying charges on the new equipment, replacement is indicated. This principle, easy to state, is more difficult to apply.

Replacement Cost Factor

In the plan studied, the amount of new capacity being installed is considerably greater than that to be retired. Thus part of the new unit is replacement capacity, the remainder being capacity added to meet system load growth. In determining the economics of retirement, only the costs of the replacement capacity were considered.

Additional capacity must be justified for an entirely different reason. All cost items in the study were adjusted so that only the share of the total costs applicable to replacement capacity were used.

The time involved is a major consideration. Few factors can be expected to remain constant year by year so that a comparison based on first-year costs may be misleading. The analysis must extend over the entire life of the proposed equipment.

In comparing the alternative plans, it might seem an obvious course to compare the operation of new capacity with the old low-pressure plant over the entire period. But such a comparison would not be realistic as it assumes that old equipment must either be replaced now or be retained for almost 40 years. The big question is not

whether these units should be operated indefinitely, but whether they can be operated profitably even a few more years.

Yearly Costs Compared

It was decided to compare the overall costs for each year from 1956 through 1993 when retirement is made in 1959 with equivalent costs over the same period when retirement is made in 1964. In each instance replacement capacity would be installed in the same year that the old capacity was retired. When analysis shows that retirement in 1959 would be more economical, it is reasonable to assume that it would be preferable to retirement in any later year. Conversely, when later retirement appears more economical, the decision can be postponed, and the factors re-examined later.

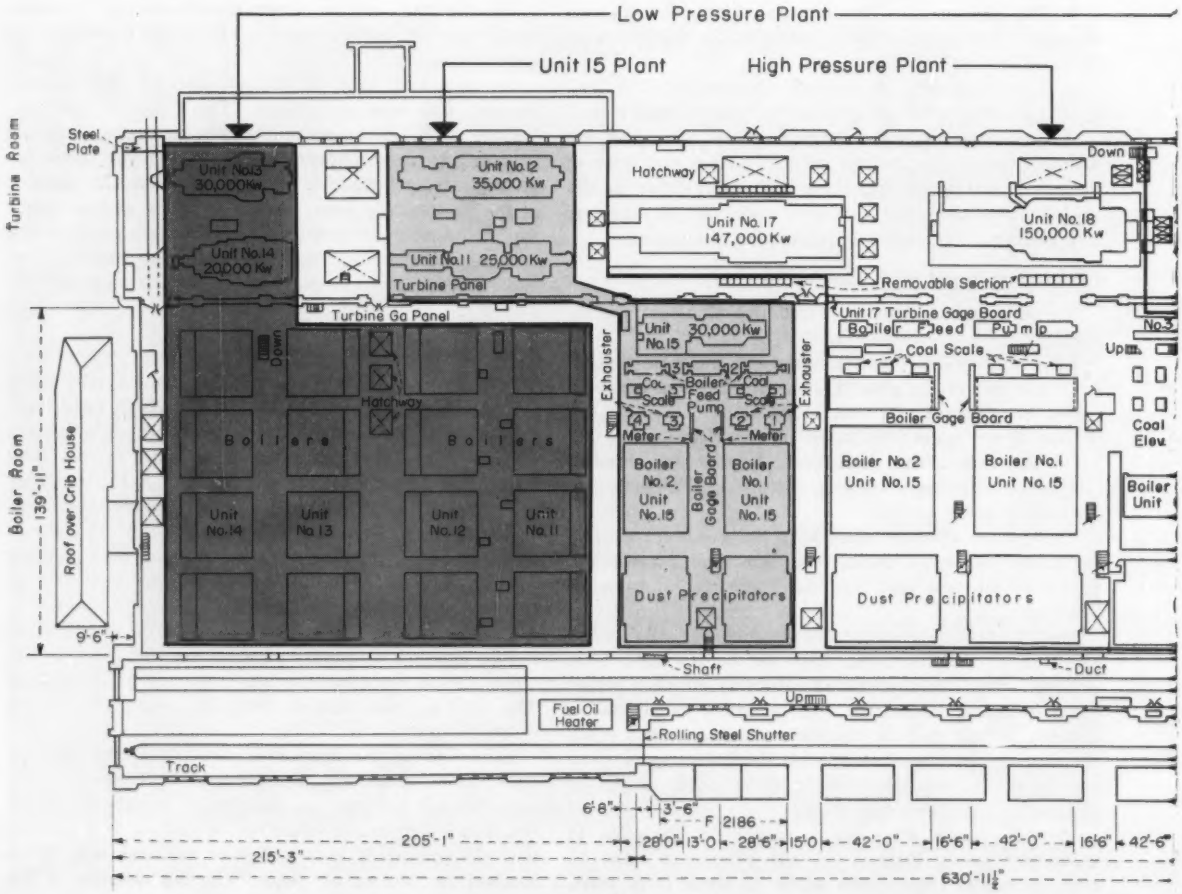
Next, the annual costs for each plan were estimated for 1956 through 1993. As only relative superiority is involved, only costs differing between the alternatives had to be considered. These costs are in six categories covering both operating and financial expenses.

The differences between the costs of the two plans can be calculated for each year to give the saving, positive or negative, effected in each category as the result of early retirement. These values can be totaled in each year to obtain the total annual savings. By accumulating the present values of the total annual savings, the difference between the alternatives can be given on a current-dollar basis.

In determining costs, the years 1956–1993 can be grouped into three periods. During 1956-1958, with the old equipment operating under either plan, the only cost difference will be certain abnormal maintenance items. These can be reduced immediately when retirement is in 1959 instead of 1964. Major differences appear in the years 1959–1963. The old equipment will operate then under Plan A. During the third period, 1964–1993, the new replacement capacity will operate under either alternative. Because of improvements in the art, however, equipment installed in 1964 should be somewhat superior in operating characteristics to that installed in 1959. This factor, favoring delayed retirement, must be reflected in the costs.

During 1956–1958, there would be no difference between the alternatives. In 1959 a new unit would be installed under Plan A with a consequent reduction in labor force. These savings apply for the five years, 1959–1963. Starting in 1964, new equipment will operate under both plans. It seems likely, however, that manpower requirements will be somewhat less for the 1964 units because of equipment improvements. This reduced cost will apply from 1964 to 1993.

Normal maintenance cost was determined by comparing maintenance costs on the present low-pressure plant, as



estimated from accounting records, with anticipated maintenance on a new unit. The cost differences apply from 1959 to 1963. After 1964, improvement in equipment should result in slightly lower maintenance costs for the new unit.

Abnormal maintenance includes outlays treated as investment rather than expense, as well as expenditures which, because of their infrequency and special nature, are not reflected in normal maintenance costs. A study of the condition of the present equipment and an item-by-item estimate were made of the minimum abnormal maintenance when the low-pressure plant is retained for both the 1959 and 1964 retirement dates.

In each case, these costs were allocated over the remaining life of the plant. For example, when the low-pressure plant is operated until 1964, $600,000 must be spent in the interval for reblading the turbines. This expense is entirely avoided by retirement in 1959.

Fuel Costs Involved

Calculation of fuel costs for 1959–1963 involves all units on the system. For replacement capacity, operating as base load, will force down the capacity factor of all older units. The resulting fuel savings may be expected to decrease year by year as the capacity factor of the replacement unit falls off with age.

Starting in 1964, a difference in fuel costs between the alternative plans would result from the greater efficiency and higher capacity factor of the 1964 unit.

Retirement of the low-pressure plant and its replacement by new capacity at a higher unit cost should bring an adjustment in state and local property taxes in the year of replacement. No differences in this column appear after 1964. It is assumed that the installation price will be the same in either 1959 or 1964.

Other carrying charges—covering depreciation, cost of money, and federal income taxes—apply only to the new capacity, carrying charges on the old equipment depending upon past investment, extraneous to current decisions.

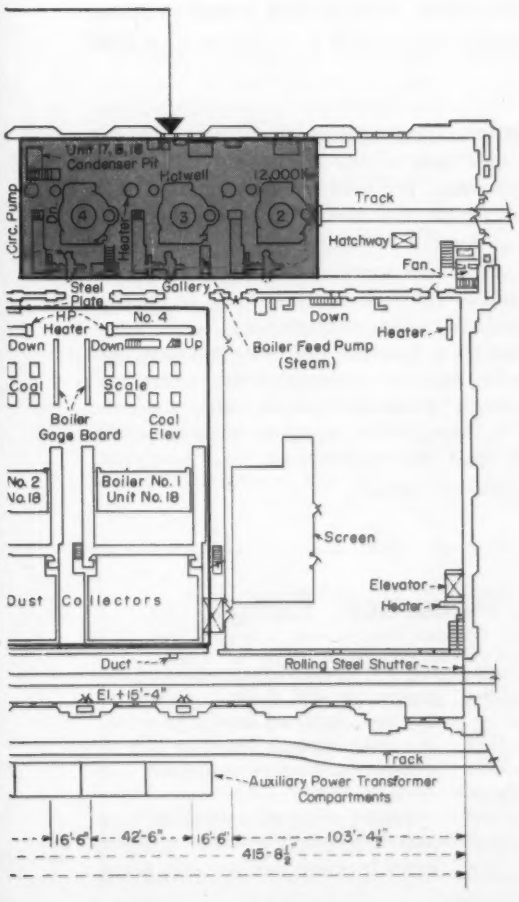
Other Costs Computed

Several different methods of computing carrying charges are available. As all have the same present value, the cumulated savings over the entire period would not be affected by the method. But the distribution of savings by years will change. The values (page 114) are level premium carrying charges. Calculations were also made by two other methods to check the validity of the level premium approach.

Determination of the costs for the two plans indicated that substantial savings are obtainable when the low-pressure plant is retired in 1959. These savings, when valued to 1955 at an appropriate rate of interest, amount to more than $1-million. The size of these savings prompts retirement of the low-pressure plant at this time.

An analysis extending to 1993 necessarily involves estimates of future conditions uncertain at best. These include not only the cost and operating characteristics of future capacity but capitalization structure, tax rate, load growth and pattern, and cost of money. Any method of analysis involves such estimates. They must be employed in considering equipment life over 35 years, and their significance is limited only by the discount factor.

As a result of the study, the low-pressure plant has been scheduled for retirement, and a new unit has been ordered.



Plan B Keeps Old Equipment Operating During Construction

	Net Capability* in Kw During Construction		Net Capability* in Kw with New Unit	
Plan A	**Winter**	**Summer**	**Winter**	**Summer**
High-pressure plant	299,000	281,000	299,000	281,000
New unit	.....	.....	305,000	290,000
Total	299,000	281,000	604,000	571,000
Present	444,000	410,000	444,000	410,000
Net change	−145,000	−129,000	+160,000	+161,000
Plan B				
High-pressure and Unit 15 Plants	378,000	356,000	370,000	340,000
Low-pressure plant (except Verticals)	57,500	52,000	.....	.....
New Unit	.....	.....	305,000	290,000
Total	435,500	408,000	675,000	630,000
Present	444,000	410,000	444,000	410,000
Net change	−8,500	−2,000	+231,000	+220,000

* Capability values used in original study dated Dec. 5, 1955.

SYRACUSE UNIVERSITY NETWORK ANALYZER LABORATORY IMPROVEMENTS RAISE CAPACITY, ACCURACY, SPEED

Network Analyzer Lab Is Joint Project

SYSTEM ENGINEERING
Planning

Syracuse University's up-to-date campus lab benefits sponsoring utilities and manufacturers as well as students and staff

The Syracuse University ac network analyzer, in operation since the fall of 1954, has those improvements and refinements developed over the past ten years that increase its capacity, accuracy, and speed. Furthermore, compared with earlier models, it requires less manpower for its operation.

The presence of the analyzer on the campus affords an excellent example of cooperation among an institution of learning and its neighboring utility companies and a manufacturer in a technological enterprise beneficial to all parties. The analyzer was provided by Niagara Mohawk Power Corp and New York State Electric & Gas Corp, in cooperation with General Electric Co.

Annual operating expenses are borne by the two utilities, regardless of their use in any year.

Analyzer time not used by the utilities is sold, when practicable, the money from such sale being earmarked for the expansion and improvement of the analyzer. It now appears, however, that the sponsoring utilities will need substantially all of the time over and above that for maintenance.

The benefits to Syracuse University and ultimately to the utility industry—come from the "internship" experience of graduate students who staff the analyzer. Through the analyzer laboratory, the university staff has opportunities for broadening and enlightening contacts.

Master Instrument System Has Speed, Accuracy, Range

J. J. WINSNESS, Medium-Voltage Switchgear Department, General Electric Co, Schenectady, N. Y.

Analyzers in use have increased from about 15 to approximately 60 during the past decade. Developments in this field during this time sought more accuracy and less time for initial setup, adjustment, and obtaining desired information. Accessories developed include the plotting table and the swing-curve calculator.

The use of automatic generator load control probably will lead to automatic load units (load units that automatically take a pre-set load from the network). This step will greatly cut analyzer setup and balancing time. The rate and extent of these and other improvements will depend on whether the time saved can justify the greater cost and complexity, together with the greater maintenance associated with the latter.

Table I shows the units in the Syracuse University network analyzer, which is in two sections, each having

its own master instrumentation. Each section can be operated individually, permitting two system studies to be pursued simultaneously. For large system studies, the entire installation can be operated as a unit, using both groups of master instruments for simultaneous readings. The recent trend is toward large installations with two metering systems, permitting more flexibility.

Probably the most important part of a network analyzer is its master instrument system whose speed, accuracy, and range largely affect its usefulness. The Syracuse University analyzer is equipped with master voltmeter, ammeter, and wattmeter-varmeter of the light-beam type. The moving elements of these instruments, being extremely light, have a very high rate of response.

A manually operated current shunt selector switch automatically changes the scale markings on these instruments, making them read directly. A push-button keyboard similar to that of an adding machine, associated with the master instrument system, permits the operator to select rapidly any point in the network at which he wishes to meter.

The current instrument burden, naturally low through the use of high-gain amplifiers and a base impedance of 1,000 ohms, is being further reduced by the introduction of large metering bus conductors. These conductors are intended to make the effect on the metering system negligible even in very low impedance loops.

Operating in conjunction with the metering system is a recording table which has an arrangement of miniature indicating lights, one for each unit in the analyzer. The lights can be arranged to match the circuits on the one-line diagram of the power system under study. The push-button selector system is interconnected with the indicating lights on the recording table so that when a particular point in the system is being metered, the light immediately below the corresponding point on the one-line diagram lights up.

MASTER INSTRUMENTATION SYSTEM includes master voltmeter, ammeter, and wattmeter-varmeter of light-beam type, having very high rate of response

Table Speeds Recording

Readings are recorded at positions indicated by the lights. The recording table speeds up recording readings, improves accuracy, and puts the readings on the one-line diagram so that operating conditions of the system are readily visualized. Operating flexibility and convenience are enhanced through the use of medical-type lamps, permitting a lamp spacing of only about ⅞ in. and of a hydraulic lift for the table top.

Generator units for the earlier analyzers were equipped with a wattmeter-varmeter. Increased use of analyzers, however, made it desirable to have more instruments of a relatively high quality on the generator units. Most modern generators have a voltmeter, wattmeter, varmeter, and sometimes an ammeter. Sometimes amplifiers minimize the burden imposed on the system by these instruments. Usually generator instruments are equipped with hand-set pointers which help operators keep each generator operating at a predetermined condition.

The generator units in the Syracuse University analyzer have a voltmeter, wattmeter, and varmeter, along with a current amplifier to minimize the instrument burden. Voltage multipliers of 1 and 2 and current multipliers of 1, 3, and 10 are used. The introduction of anti-parallax calibration pointers and the elimination of calibration markings just behind the pointers increase accuracy in setting generator outputs. The addition of automatic load control, now being considered, would permit an operator to pre-set the load that a generator is to maintain.

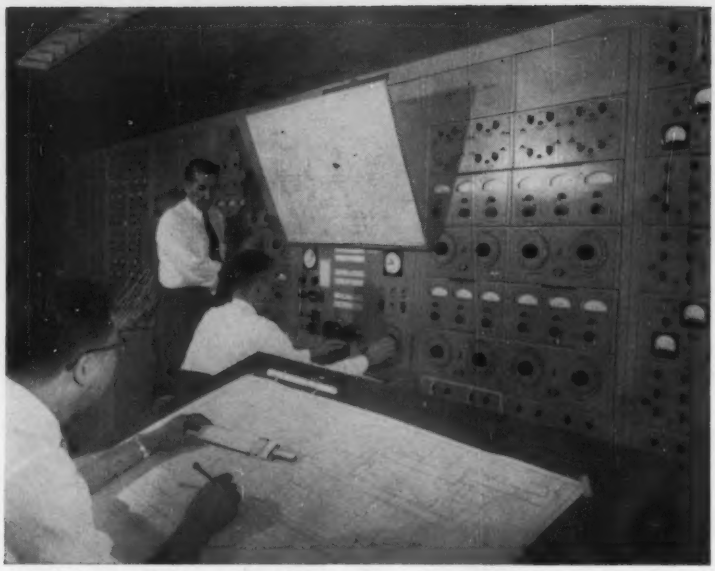
The Syracuse analyzer is equipped with a newly developed load unit consisting of resistances and reactances in parallel, which can be calibrated directly in watts and vars. This load unit is an improvement over earlier types. Adjustable resistances and reactances in series or parallel were difficult and time consuming to rebalance as system conditions changed.

Committee of 3 Controls Lab Time

Top control of the network analyzer laboratory is in a coordinating committee of three—a management-level representative from each utility and from the university. This committee:

1. **Makes the initial schedule of analyzer time semi-annually (two or three months in advance of each six-month period).**
2. **Sets laboratory staff levels.**
3. **Approves the annual budget.**
4. **Sets the conditions for outside sales of analyzer time.**

In addition, any other question beyond the normal jurisdiction of the analyzer supervisor would be referred to the coordinating committee.



RECORDING TABLE, operating in conjunction with metering system, has miniature indicating lights matching circuits on diagram of system under study

The use of autotransformers with load units calibrated directly in watts and vars permits more precise and stable settings at high load levels than was heretofore possible.

Earlier network analyzers had individual line and capacitor units. To form pi-line units to represent long lines, one line unit had to be connected to two capacitor units. Pi-line units have now been developed which include the line unit and capacitor unit components as an integrated unit. Syracuse University has developed a toggle switch connecting a standard line unit and two standard capacitor units to form a pi-line unit. Such an arrangement permits the analyzer to have pi-line units without sacrificing flexibility.

Although there are analyzers that operate on frequencies of 50 to 10,000 cps, most of them operate in the 400 to 500-cps range where components can be reasonably small and capacitance problems in the high frequency range are avoided. Some analyzers operate on a base current of a few milliamperes up to a few amperes. Smaller currents call for precautions to avoid leakage and losses because of charging currents or stray capacitance. Higher currents require precautions to avoid resistance drop and to reduce heating.

The Syracuse University unit operates at 480 cps, with a base current of 0.05 amp and a base potential of 50 v. The resulting base power is 2.5 w, and the resulting base impedance is 1,000 ohms.

In accordance with the relatively high value of base impedance, the construction of the analyzer throughout is such as to minimize the distributed capacity of the analyzer network elements. In addition, considerable work has been done and is continued to reduce the series resistance of the metering buses, the ground bus, the metering relays, and other elements to very low values.

These factors, together with the fact that the generator currents may be as high as 20 per unit and the line impedance can be set with a fineness of 0.1% steps, will give this analyzer an unusual ability to handle a very great range of different types of system simultaneously. By properly choosing the power base for the study, one may study simultaneously all phases of the system from the transmission to the lowest sub-transmission and higher distribution voltages with good accuracy in all parts.

Table I—Number and Type of Circuit Units

Type	No.
Line units	125
Pi-line units	75
Load units	64
Capacitor units	150*
Autotransformers	32
Generator units	16
Mutual transformers	50
Master instruments	2

*Capacitor units can be used individually or associated with line unit to form pi-line unit.

Study Techniques Keep Pace with Analyzer Design

H. B. SMITH, Power Control and Planning Department, Niagara Mohawk Power Corp, Syracuse, N. Y.

R. B. MACKENZIE, Electrical Engineering Department, New York State Electric & Gas Corp, Binghamton, N. Y.

The complexity of engineering calculations required for daily operating and system planning increased immeasurably as electric utilities expanded their facilities to meet the ever increasing demands for power. Calculating by hand methods the performance of most present-day system networks at several load levels with various alternate system arrangements is prohibitive in cost and manpower. Although dc calculator methods serve in some instances, they are impractical, if not impossible, in most extensive and complicated system problems.

Transient Pattern Plotted

To meet today's needs of the electric utilities the ac network analyzer and the ac network analyzer study have been developed over the years.

The network analyzer produces in electrical miniature any steady-state system condition. Desired system variables, such as kilowatt and kilovar flow, voltage, current, impedance, and phase angle can be measured directly with considerable accuracy and dispatch. Transient conditions are represented by a series of steady-state conditions, and the results are plotted to represent the transient pattern.

While improvements in analyzer de-

sign have been considerable, improvements in analyzer operation and analyzer study techniques have been even greater. Using modern methods and practices, an experienced team can mass produce more data in a day than an engineer can hand calculate in a year.

Types of Studies Made

To operate a power system efficiently and to plan for the future properly, the following types of studies are made for the various parts of the utility system (generating system, transmission system, sub-transmission system, and distribution system):

1. Load flow and voltage control studies.
2. Fault studies (circuit breaker duties, relay settings).
3. Stability studies (machine and system design and relay settings).
4. System power loss studies (economic scheduling of generators).
5. Sleet-melting studies.

Preparation Takes Time

Proper preparation for an ac network analyzer study always takes more time than is actually spent at the analyzer. Such preparation is in three phases:

1. Planning the scope and pattern of the study.
2. Compiling basic data in a form readily transferable to the analyzer.
3. Preparing forms and diagrams for recording results and keeping track of board conditions.

The first phase of preparation involves a decision on what is to be studied, what are the objectives, and how they are to be attained. Normally power flow and voltage studies deal with some future time and condition. Consequently, details of system arrangement and conditions must be forecast. Inaccurate load, generation, or construction forecasting can invalidate much of the resulting data.

Listing Tentative

After system conditions have been chosen, the tests should be tentatively listed. Their order should be such that a minimum time is spent in analyzer load, generation, and connection changes. At this point it is important to approach the study with an open mind, alternative solutions being considered. A plan should be accepted or rejected only after the results are in and all variables have been considered.

The form and type of basic data required vary with the type of study. Load flow and voltage studies require system impedance and susceptance data, load and generation schedules, transformer tap data, voltage schedules and limits, reactive power source data, increment generation cost data, and machine capabilities.

A short-circuit study requires impedance data (including positive, negative, and zero sequence values), relay data, interrupting rating of circuit breakers, and generator internal impedance data. Stability studies require all the data aforementioned plus rotating machine inertia constants.

Rechecking Essential

In general, the same basic data are required for an analyzer study as would be necessary to solve the problem by long-hand methods. Basic data for an analyzer study, however, must be in percentage or per-unit on a suitable kva base.

Methods for recording results and keeping track of analyzer changes in terms of changed system conditions vary considerably from utility to utility. The method of bookkeeping is not important provided it allows checking back at some future time should some question arise. Factors difficult to recheck are transformer taps and capacitors which represent line charging. A running record of these data, taken during each test, is often worth the time spent on it.

The generally accepted method of recording results is marking data directly on a system schematic diagram near the component (circuit, generator, transformer, etc) for which the reading is taken. Recording should be careful as the most accurate test is worthless when a few key readings have been incorrectly or illegibly transcribed.

The test recording diagram should be kept as small as practicable while allowing adequate space for small, neat lettering-in of the analyzer readings. Test recording diagrams should be produced by making thin sepia prints (brown line) from an ink or pencil tracing. After test data have been recorded on these sepia prints, the sheets can be run through a blue-line reproduction machine to produce copies of each test diagram. When desirable, reduced-size reproductions of the test diagrams may be made by the photostat method. When the analyzer has an indicating-light recording table, a facsimile of the table top, showing light locations, should be used as a guide in designing the test recording diagram. This may result in a somewhat larger diagram than might otherwise be used.

Idle Time Cut

There is an advantage in having test diagrams proportioned so that they can be filed or bound in a report without photostatic reduction. But there may be times when a larger diagram is necessary to allow adequate space for recording results and making notes.

Analyzer operation and study techniques are built around a single goal—maximum results with a minimum of errors. Maximum analyzer efficiency is obtained when there is no time during which the analyzer is idle and when analyzer connection changes, analyzer balancing, and analyzer calibrating take up a minimum of study time.

Duties Divided

Division of responsibility for analyzer study operations between analyzer and utility personnel varies from place to place. Basically utility personnel are responsible for preparing and providing system data (generation schedules, impedance and susceptance data, transformer tap data, and system changes) in the form required by the analyzer.

Analyzer personnel make the initial connections and adjustments, the subsequent changes, and double check to see that the analyzer correctly represents the desired system conditions.

At least three persons are needed—two analyzer men to operate the analyzer, read, and record the test data, and one utility man to direct the study. A more practical minimum would be two of each. This would allow one utility man to prepare individual test diagrams (add special notes, etc) and assist in the analyzer operation and test recording. The second utility man, directing the study, would be free to study results, revise the tentative list of tests, make written comments on completed tests at a time when ideas are fresh in his mind. Later such comments are valuable in digesting the study and preparing the formal report.

The directing utility man should also attend to or supervise the bookkeeping which should include an accurate account of all changes made on the analyzer subsequent to the initial hookup. Instructions for transitory system changes—switching, etc—must

be written down before that test. Such instruction for system changes are translated by analyzer personnel into analyzer changes, using the analyzer plugging diagram.

Changes Are Checked

Physical changes are made on the analyzer—by two men for checking purposes—and concurrently on the analyzer plugging diagram by a third man. The directing utility man should check the changes appearing on the plugging diagram against his original system changes. Colored map pins, or their equivalent, can be used on the plugging diagram to indicate the actual conditions of the analyzer at any particular instant (similar to an operating diagram on an actual power system).

When a third utility man is available, he can assist in the bookkeeping under the director's supervision.

The accuracy and usefulness of the final results are his responsibility.

Assuming the first two utility men are engineers, it would be well to select someone—with engineering background—from the operating department as the third man. He should be able to give first-hand information on system operating procedures. Later his network analyzer experience will benefit him in dealing with actual system operation.

When there is any chance that system power loss for a particular test will be of interest, current readings for each branch of the network should be taken from the analyzer and recorded. Accurate system power loss can be obtained only by calculating the I^2R loss in each branch of the network.

Notes Are Helpful

Analysis or digestion of the analyzer tests usually takes a good deal of time. Commentary notes on the various tests made by the directing engineer during the study can be of great help. Though not necessary, it is often helpful to have some of the test diagram data transcribed into tabular or graph form to bring out comparisons of certain effects for the various system plans considered. Included might be such items as the following:

1. Voltage levels at key points.
2. Voltage phase angles between certain key points.
3. Power flow in important circuits and transformer banks.
4. Amounts of reactive power required at various points.
5. System power loss.
6. Short-circuit currents at key points.

The ac network analyzer should not be considered a mechanical brain. The answer to a system problem results from a careful analysis of all pertinent data. The analyzer performs quickly what would otherwise be long and arduous work.

Nevertheless the engineer must still make the decisions.

Sponsoring Companies and University Share Benefits

D. W. SPENCE, Network Analyzer Laboratory, Syracuse University, Syracuse, N. Y.

The analyzer laboratory as a cooperative venture has produced a number of benefits for all parties. Technical people are brought together in a technological enterprise. As the analyzer is not in one of the utility's engineering offices and not under its direct control, the utilities benefit in several ways:

What Utilities Gain

1. Physical maintenance and future modification and modernization of the analyzer are the physical responsibility of the university research organization with its wide variety of knowledge and skills.
2. Utility engineers who conduct the studies are able to exchange ideas and problems with university personnel with a different viewpoint than their own.

What University Gains

The university benefits by having an excellent continuing contact with the utility industry and from the financial support and experience afforded the university staff members and graduate students working in the laboratory.

A steady flow of live engineering problems, generated by a growing alert utility, and contact between university personnel and the men who formulate and must find eventual solution for the problems are necessary conditions for the success and even the survival of a university network analyzer laboratory.

What Lab Must Offer

To obtain good utility patronage, an analyzer laboratory must maintain high standards of competency and have adequate manpower. Furthermore its operation must be regular and free from interruption. Ideally it needs a competent supervisor with experience whose standing in his organization attracts manpower. He should be able to stimulate study, coordinate operations, study techniques and equipment with an eye to improvements and generally take responsibility for the successful functioning of the laboratory.

Steady Manpower Needed

The chief operator should be on a fulltime basis. He must be competent, well-trained, experienced. Two or more competent assistant operators, one fulltime, should be employed. Except fc the supervisor and perhaps the chie operator, this manpower may be composed of graduate students, preferably evening students with a light load of graduate studies. They should give most of their time to the laboratory. The flow of such students should be steady enough to maintain full manpower strength in regular progression and turnover.

Why Unit Is Unique

Maintenance of such an exacting, industrial-type activity is not too congenial to the customary operation of a university where prime emphasis is usually on the educational process and students and staff are generally free to pursue knowledge according to their needs and interests. Many universities have found that maintenance of high performance standards in their analyzer laboratories is burdensome at times.

Syracuse University's experience, however, is that the demands of day-to-day operation are not too burdensome and that the analyzer staff has more freedom than many groups working on sponsored, closely controlled electronic research.

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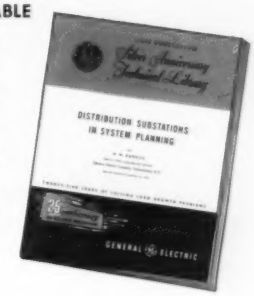

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For more information, ask for bulletin GER-1194, "New Design Improvements for G-E Metal-Clad Switchgear" or for product descriptive bulletin GEA-5664. Contact your G-E Apparatus Sales representative, or write to Section 511-15A, General Electric Co., Schenectady 5, New York.

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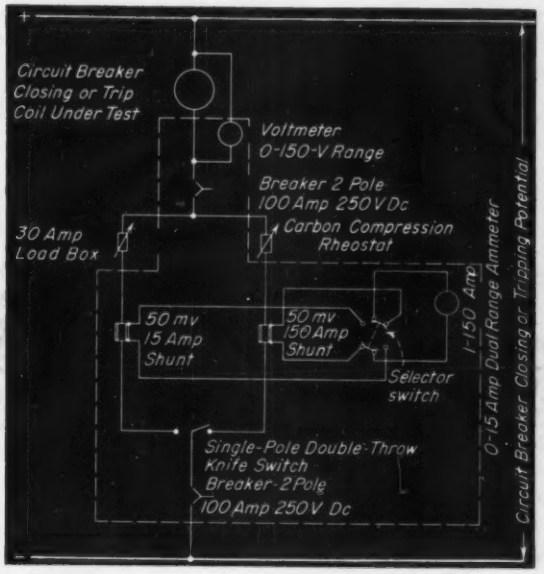

Circuit Breaker Closing or Trip Coil Under Test
Voltmeter 0-150-V Range
Breaker 2 Pole 100 Amp 250 V Dc
Carbon Compression Rheostat
30 Amp Load Box
50 mv 15 Amp Shunt
50 mv 150 Amp Shunt
1-150 Amp
Selector switch
Single-Pole Double-Throw Knife Switch Breaker-2 Pole 100 Amp 250 V Dc
0-15 Amp Dual Range Ammeter
Circuit Breaker Closing or Tripping Potential

COMPONENT PARTS and wiring for test set are shown. Voltmeter is connected across coil, ammeter in series with it

MINIMUM CLOSING VOLTAGE and current check on 5-kv, 1,200-amp air circuit breaker is made with portable test set

DISTRIBUTION—Maintenance

Coil Tests Detect Circuit Breaker Troubles

R. W. PFEIFFER, Sr. Assist. Substation Maintenance & Construction Engr, Union Electric Co of Missouri, St. Louis, Mo.

Minimum closing and tripping voltage and current tests, performed with portable, home-made assemblies of simple construction, detect mechanical and electrical troubles in circuit breakers on the Union Electric Co's system.

Rheostat, Load Box Used

A test set consists of a voltmeter connected across the coil under test and an ammeter in series with the coil. It includes suitable ammeter shunts, and ammeter scale selector switch, a knife switch, and a breaker. A dual-range ammeter covers the broad range of currents involved, from less than 1 amp on some breakers to more than 100 amp on others.

A carbon compression rheostat and a 30-amp load box are used in conjunction with the test set. The rheostat varies high currents drawn by some closing coils, and the load box the lower closing and trip coil currents. Minimum closing and tripping voltage and current tests are performed on a breaker before and after each scheduled servicing or overhaul.

When a breaker mechanism is dirty and gummed, slow operation results and the closing coil requires more than the normal minimum current and voltage for closing the breaker. When a trip coil plunger or trip latch is bound, excessive current and voltage are required. Minimum closing current and tripping voltage and current tests detect these conditions. They also show up defective control devices, wiring, and connections. Mechanical defects in breaker linkages have been discovered through these tests, and coils have been found in various stages of deterioration. Because they can detect potential sources of trouble, the tests have been an effective aid in circuit breaker maintenance.

Air, Oil Breakers Tested

The diagram shows use of the equipment for checking minimum voltage and current for closing a 5-kv, 1,200-amp air circuit breaker. Similar checks are made on oil circuit breakers. In checking a closing the rheostat or load box is adjusted to a point where voltage across the coil under test is somewhat above the value at which the breaker fails to operate. Coil voltage is then decreased until the breaker is just able to operate. Voltage and current for this condition are read and recorded. The voltage is then decreased until the breaker just fails to operate, and again voltage and current are recorded.

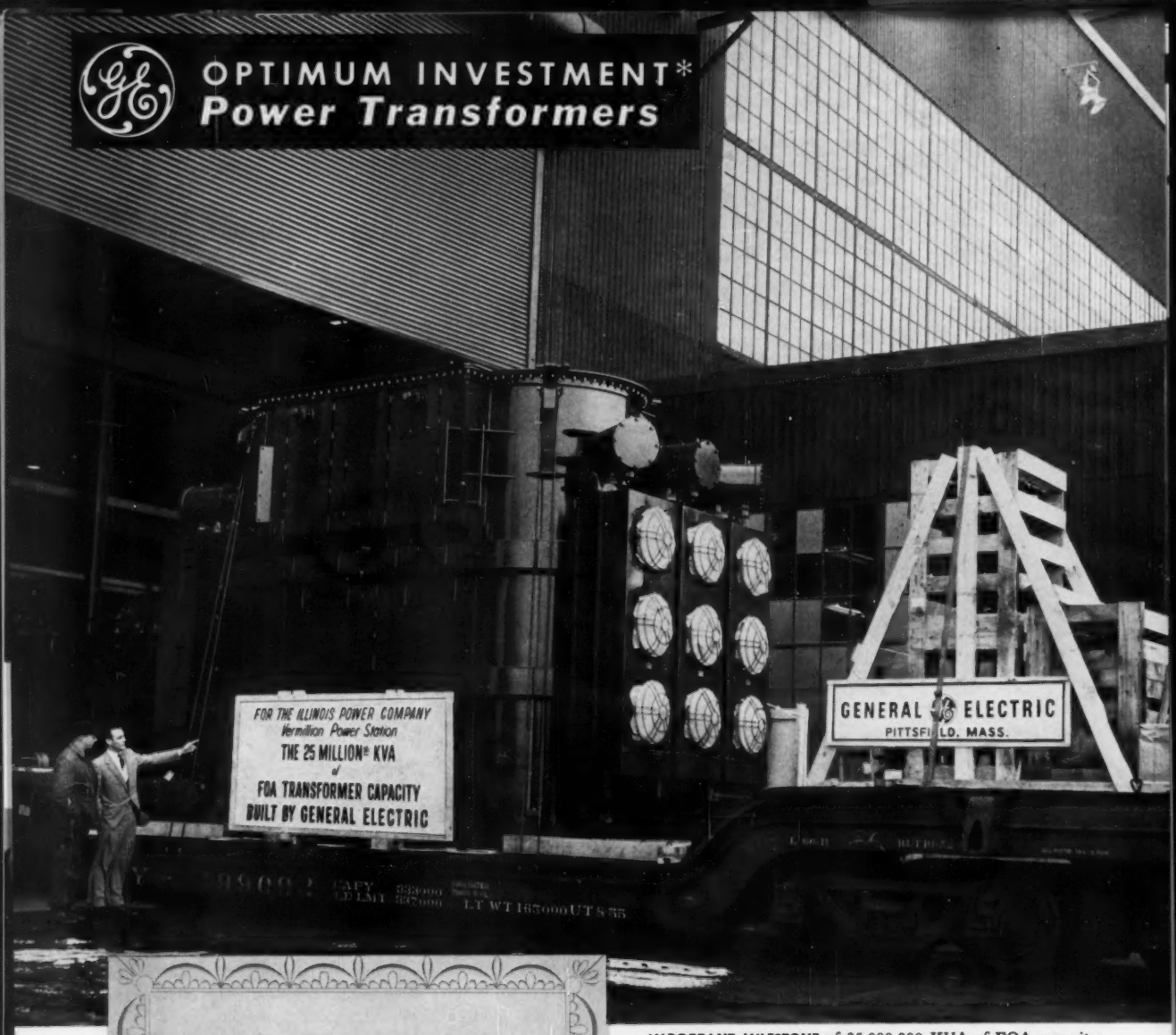
Readings Compared

These voltage and current values are compared with past readings and checked against maximum and minimum acceptable values. Voltages are also correlated with NEMA standards. Maximum and minimum acceptable values of minimum closing and tripping voltages and currents, set up through experience for various types of breakers, serve as a guide and standard in these tests.

A similar check on the trip coil determines the minimum voltage and current needed to trip the breaker and the maximum voltage and current at which the breaker fails to trip.

(More How To on page 132)

OPTIMUM INVESTMENT*
Power Transformers

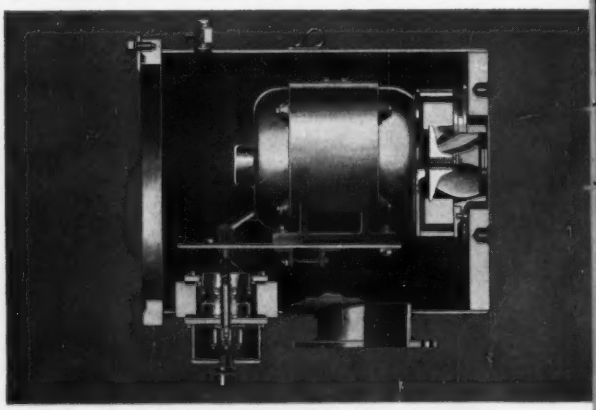


*Optimum Investment

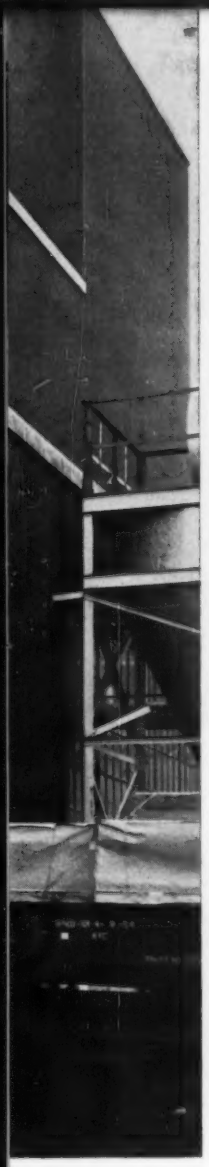
Your assurance of lower long-term cost, plus greater dividends from your large power transformer investment, through:

- **LOW ENGINEERING COST:** G-E field services reduce your engineering expense.
- **LOW PURCHASE COST:** Skill to produce optimum design for each application.
- **LOW INSTALLATION COST:** Upright shipment, one-piece tank speeds handling.
- **LOW OPERATING COST:** Permanent, better characteristics for lasting economy.
- **LOW MAINTENANCE COST:** Product improvements and few failures reduce outages.

IMPORTANT MILESTONE of 25,000,000 KVA of FOA capacity shipped by G.E. was reached earlier this year. Increased purchases mean next 25 million KVA should be built by 1961. Unit was shipped upright for easy installation with all accessories on the same flatcar.



EXCEPTIONALLY RELIABLE PUMP MOTOR is key to acceptance of FOA units—fewer than ten have ever been removed from service for any reason. Pump can be mounted in the ideal hydraulic position above unit coolers.



Utilities save $14,000,000 in 19 years by using G-E FOA power transformers

Milestone of over 25,000,000 KVA of forced-oil-air cooled capacity in service typifies big, first-cost savings available to utilities.

Large capital savings may be possible when you purchase a power transformer. Consider cooling methods. Earlier this year, the power transformer containing General Electric's 25 millionth KVA of FOA (forced-oil-air cooled) capacity was shipped. Compared to the price of more costly units which would have been built with other types of cooling, utilities saved over $14,000,000 in capital expense.

Such first-cost savings are available to power transformer users who choose FOA cooling. In other areas too, such as reduced BIL (basic impulse insulation level), three- or single-phase, and auto- versus conventional transformers, significant capital savings may be possible for a specific application. These savings are made possible by continual product improvements.

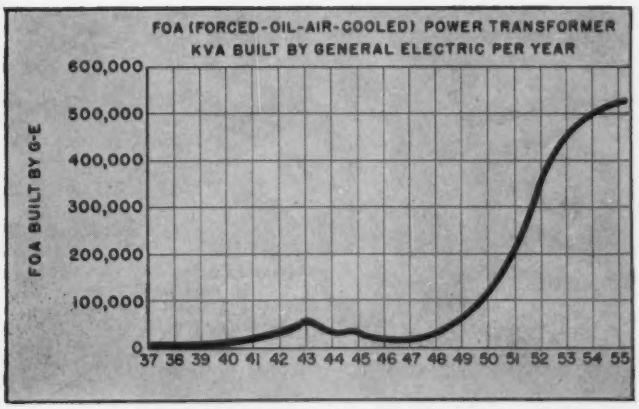
IMPORTANT FEATURES of FOA cooling are the directed-flow concept, the reliability of the oil pump, and the ability to operate for a specified period without auxiliary power. The directed-flow design, introduced by G.E. in 1937, coordinates the amount, velocity, and paths of pump-driven cooling oil. This cost reduction is made possible, basically, by substituting low-cost electrical energy (to operate pump motors) for the high-cost extra copper and steel that would be required by self-cooled designs.

OIL PUMP RELIABILITY, which permits the G-E pump to be located in the optimum hydraulic position on top of the unit cooler—giving a positive oil pressure inside the heat exchanger—is proved by the fact that fewer than 10 pumps, out of the nearly 2000 in service, have ever required removal for any reason. At least one hour's operation at full load, without auxiliary power, depending on previous loading, permits the application of FOA units even in unattended substations.

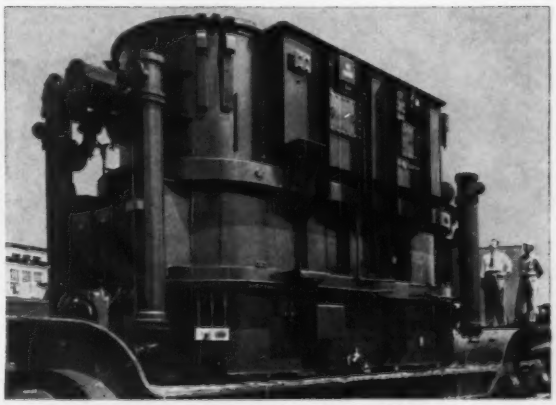
These are examples of features designed to give you a low purchase price. There are more. And, combined with other features that give low operating, installation, maintenance and engineering costs, they make your General Electric Power Transformer an *Optimum Investment.* General Electric Company, Schenectady 5, New York. 421-40

Progress Is Our Most Important Product

GENERAL ELECTRIC



TREND TO FOA shows accelerating utility acceptance. Economy and reliability have led to fact that 65% of large power transformer KVA, currently being shipped by G.E., is FOA.



FOW (forced-oil-water cooled) power transformers offer additional economies where adequate water is available for cooling transformers. Shown is 275 MVA unit.

All the features you asked for make 1956

RM* Medium Transformers

Your Best Buy

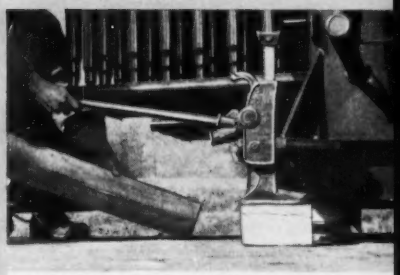
For further information on G-E Medium Transformers, contact your nearest G-E Apparatus Sales Office, or write Section 416-6, General Electric Company, Schenectady 5, N. Y.

*Repetitive Manufacture

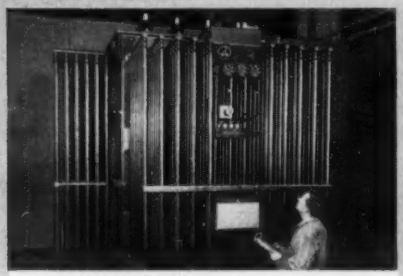
Progress Is Our Most Important Product

GENERAL ELECTRIC

SLED-RUNNER BASE on all G-E RM transformers slides easily or rides smoothly over rollers, makes installation simpler. Wide face on I-beam will not cut rollers.

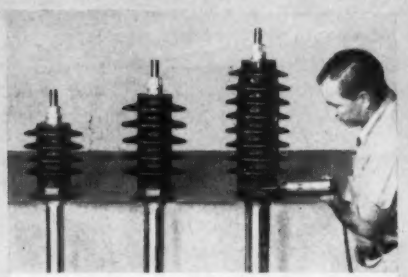


LIBERAL JACKING SPACE cuts installation time and effort. Minimum of 5½ inches between jackpad and ground provides more-than-adequate clearance for most jacks.

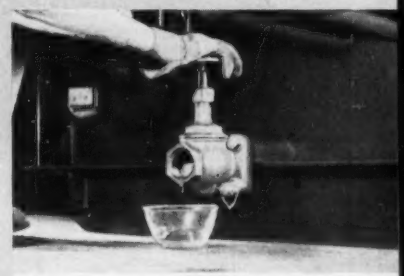


CONTROL CENTER groups all instruments and nameplate in one easy-to-see area; improves visibility, makes readings extra simple. Chances of error are reduced.

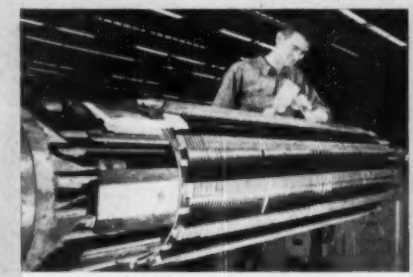
PROTECTED ACCESSORIES are recessed behind cooling tubes, sheltered against damage from blows that might be encountered during shipping and installation.



AMERICAN STANDARD BUSHINGS, used on all General Electric Repetitive Manufacture Medium Transformers, enable you to reduce your bushing inventories.

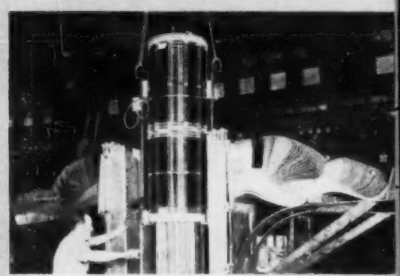


FULL DRAIN permits complete filtration, removes worst bottom oil. Sampling is more accurate, since sample is drawn from region of greatest contamination.



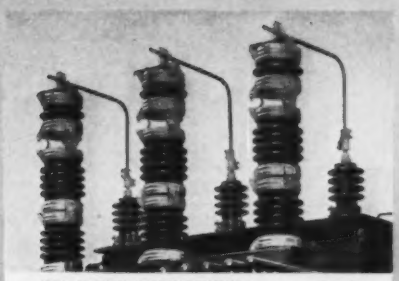
FORMEX* insulation is extremely rugged, has phenomenally high dielectric strength. Permits more compact, lighter RM transformers.

*Reg. Trade-mark G.E. Co.

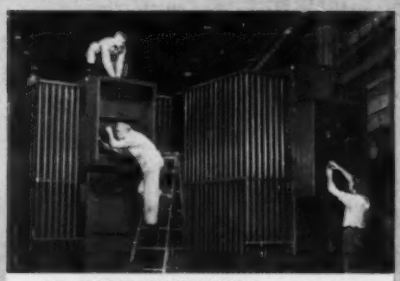


PRE-FORMED CORE, used in single-phase RM medium transformers, reduces core losses since magnetic flux path follows grain in core laminations, even at corners.

VENTILATED BASE permits free air circulation, helps prevent moisture from condensing under transformer, minimizes rusting and corrosion in this hard-to-reach area.



PRE-FITTED CONNECTORS between bushings and G-E Magne-valve lightning arresters simplify field installation, give better lightning protection.



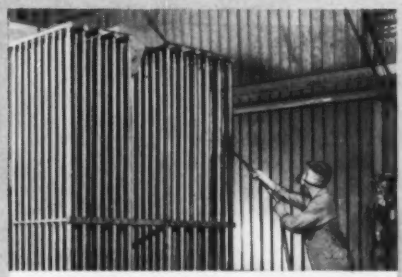
REVERSIBLE JUNCTION BOX readily adapts to overhead or underground system, simplifies ordering and interchangeability, provides additional flexibility.

ONE CONTROL CONDUIT simplifies field wiring of accessories and controls. Connections for entire transformer are made to a single terminal board, shown above.

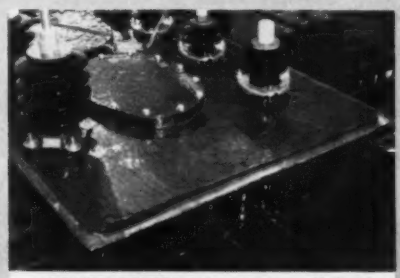
TILTED INDICATORS. Where control center group is sufficiently high above ground, indicators are tilted at proper angle to make instrument reading easier, more accurate.

CONDUITS AND FITTINGS for all control wiring are weather-tight, can be field assembled in minutes without cutting threads. Cover plate gasket is re-usable Nitrile.

NITRILE GASKETS resist weathering, seal without adhesives; no chipping required for removal. Re-usable again and again, they permit reduction of gasket inventories.

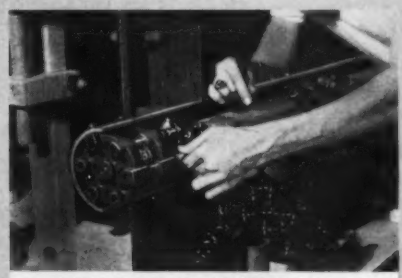


SUPER MELAGLYP FINISH saves up to two repaintings, is longer lasting in corrosive atmospheres. Metal is specially prepared for better adhesion, more uniform coating.



DOMED COVERS let water run off, help prevent dirt and rust from accumulating. Flanges around openings prevent foreign matter or moisture from rolling into tank.

SPRAY-ON PAINT, provided with every RM transformer, permits touching up of spots chipped or scraped during shipment or installation, before rust gets foothold.



WEDGE-TYPE TAP CHANGERS have rugged self-aligning contacts with wedging action to assure line contact. They can carry transformer's full-rated short-circuit current.

LARGER MANHOLES, introduced this year, mean easier accessibility to interior; allow easier and more accurate inspections. Even a husky man has plenty of room.

GENERAL ELECTRIC

Rigid Jacks Facilitate Cable Handling on Job

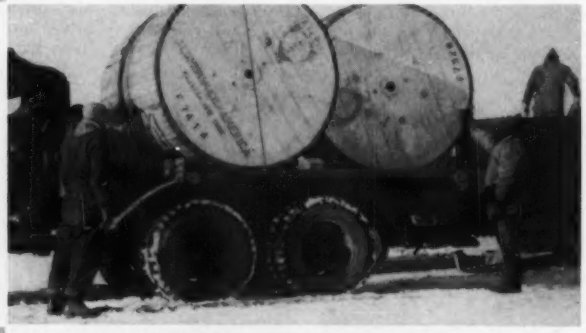
ALBERT V. CHRIST, Supervisor, Utilities Line Construction Co, Inc, Jenkintown, Pa.

Attaching rigid jacks to each cable reel before it is unloaded onto the ground has speeded up transmission construction for the Utilities Line Construction Co, Inc. The procedure is applicable to distribution line construction also.

When delivered by truck to the pulling site, a reel of conductor is eased onto the tailboard. There the axle is inserted with jacks attached before the reel is lowered to the ground. The reel and jack are thus placed on the ground as a unit, already positioned for paying off the cable. The complete operation takes only four men.

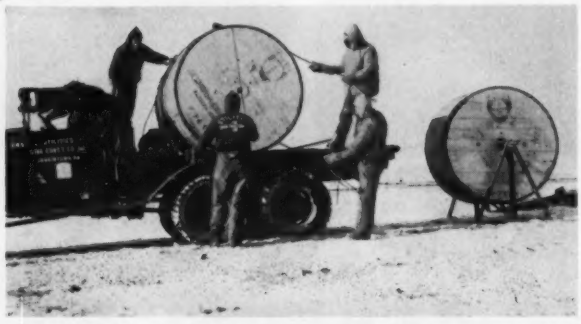
This method has proved much faster than the previous practice of lowering reels to the ground, then manhandling them into position and jacking them up to permit paying out the conductor.

PULLING LINE IS ATTACHED TO THE FREE END OF THE CABLE



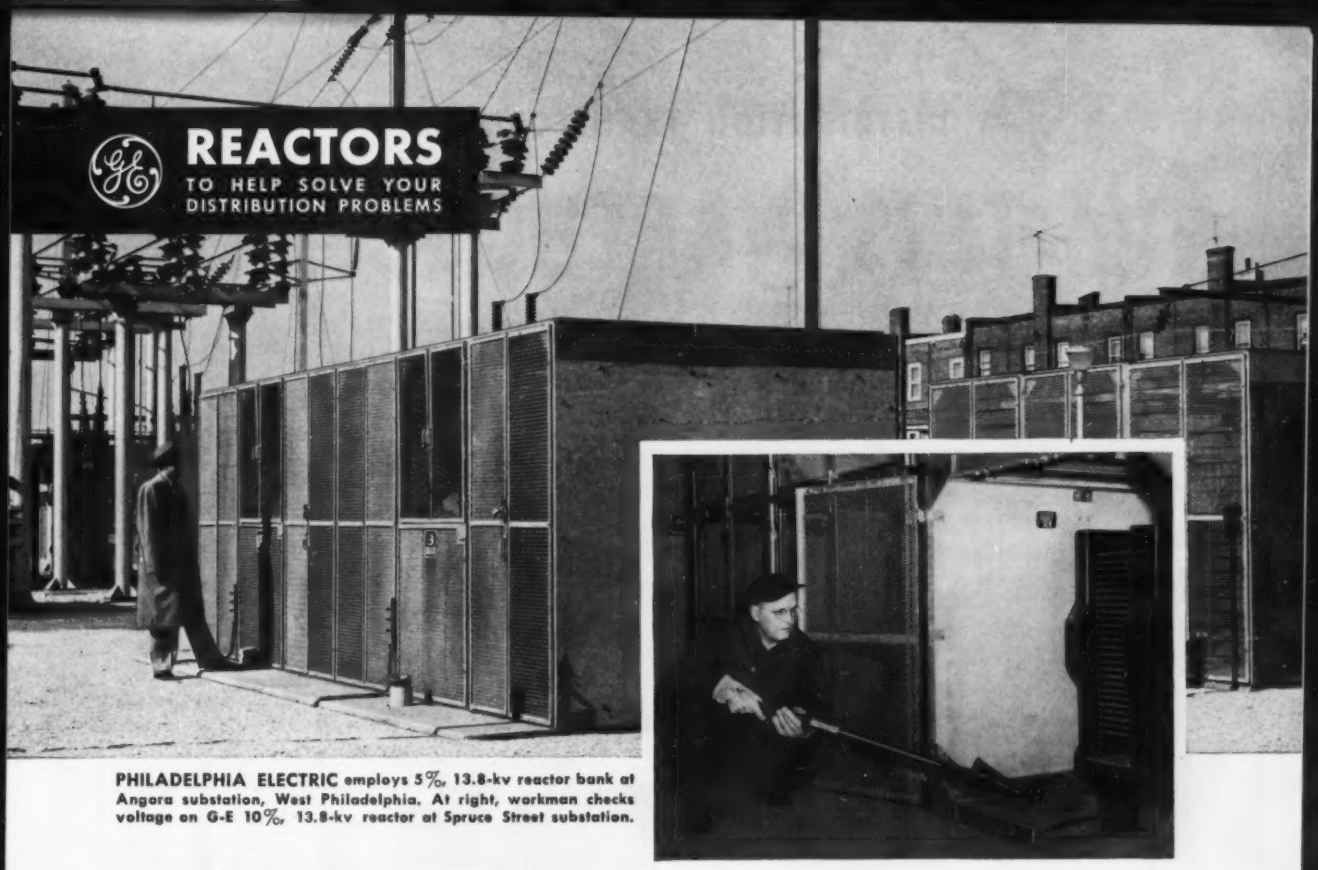
REELS OF CABLE ON THE TRUCK ARRIVE AT CONSTRUCTION SITE

JACKS ATTACHED, A REEL IS EASED OFF TRUCK TAILBOARD



FIRST REEL STANDS READY FOR PAYING OFF THE CABLE

(*More How To on page* 136)



PHILADELPHIA ELECTRIC employs 5%, 13.8-kv reactor bank at Angora substation, West Philadelphia. At right, workman checks voltage on G-E 10%, 13.8-kv reactor at Spruce Street substation.

Philadelphia Electric shows how

General Electric Reactors Reduce System Investment

Philadelphia Electric Co. has adopted standardized short-circuit ratings on switchgear and other system equipment—150,000 KVA on all 2400- and 4160-volt feeders; 150,000 or 250,000 KVA on 13.8-kv lines. Reactors are used to limit feeder duties to these values. Results: cost savings through quantity equipment purchases; additional savings since reactors often permit selection of less-costly switchgear having lower short-circuit capacity.

RELIABILITY: The almost-perfect service record of G-E reactors attests to dependability of G-E cast-in-concrete design, with such features as:

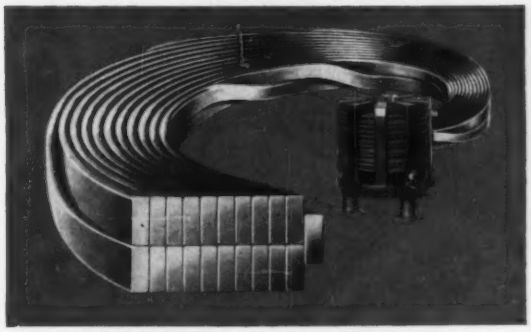
Wet-steam-cured concrete: full strength when shipped avoids potential danger of "in-service" curing.

Rectangular transposed conductors: minimum losses and increased short-circuit strength.

Non-aging glass insulation: optimum temperature and moisture resistance, high dielectric strength.

Aluminum conductors as standard construction: nearly 10% saving over designs using copper.

Repetitive-Manufacture designs with aluminum conductors: 8% added saving plus shorter shipment. For full information contact your G-E Apparatus Sales Representative, or write to Section 422-30, General Electric Company, Schenectady 5, N. Y.



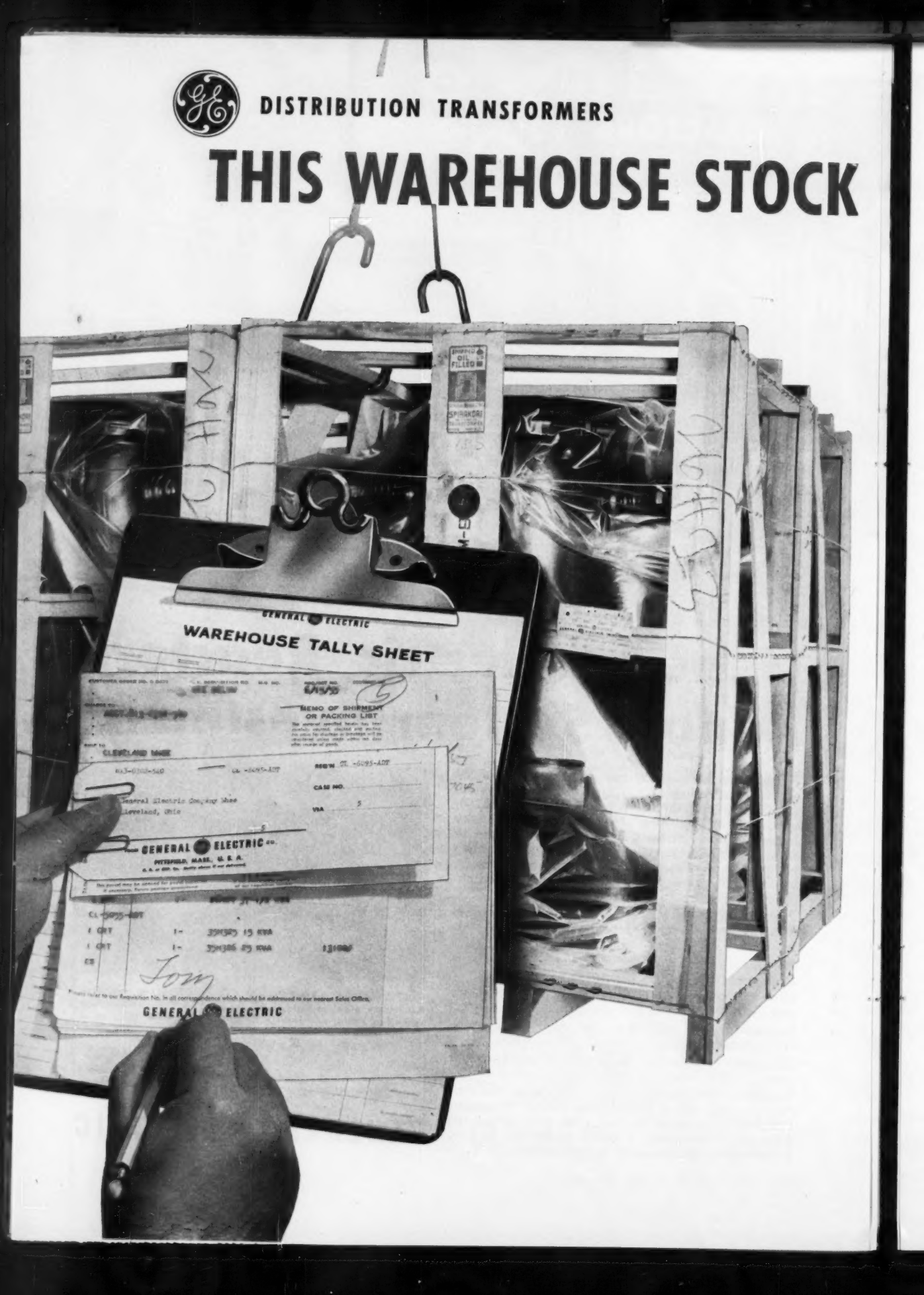
RECTANGULAR TRANSPOSED CONDUCTOR, an exclusive G-E feature, provides highly uniform current distribution with lower skin-effect losses; permits size reductions over round cable up to 20 percent without sacrificing electrical turn-to-turn insulation.

Progress Is Our Most Important Product

GENERAL ELECTRIC

DISTRIBUTION TRANSFORMERS

THIS WAREHOUSE STOCK



COULD SAVE YOU...$24,000

General Electric's nationwide transformer stocks can save you heavy inventory expense

One Midwest utility, relying on the local General Electric warehouse for fast delivery and complete stock, cut back its distribution transformer inventory by an impressive $400,000. At a 6% carrying charge, this saves $24,000 per year—without including the hidden expenses of handling and storing the transformers.

G-E warehouses can cut your inventory costs. Open twenty-four hours a day for emergencies the nationwide chain of more than 100 General Electric and agent warehouses provides extra-fast delivery of G-E distribution transformers in all standard ratings. This service, can save you significant sums in inventory space and handling expense.

Look at the other money-saving features that prove "all transformers are not alike": Impulse testing, saves years of transformer life. **One-piece clamping bands** save maintenance time. Reusable **Nitrile rubber gaskets** help save units from contamination. **AL/CU terminals** are designed to prevent both copper and aluminum conductors from loosening. **Strenicor terminal clamps** save terminals from breaking. **Super Melaglyp** paint saves up to two repaintings. **Service shops** can cut your repair and rebuilding costs.

For the complete story, contact your nearest G-E Apparatus Sales Office or G-E Agent—or write to General Electric Company, Section 431–42, Schenectady 5, New York.

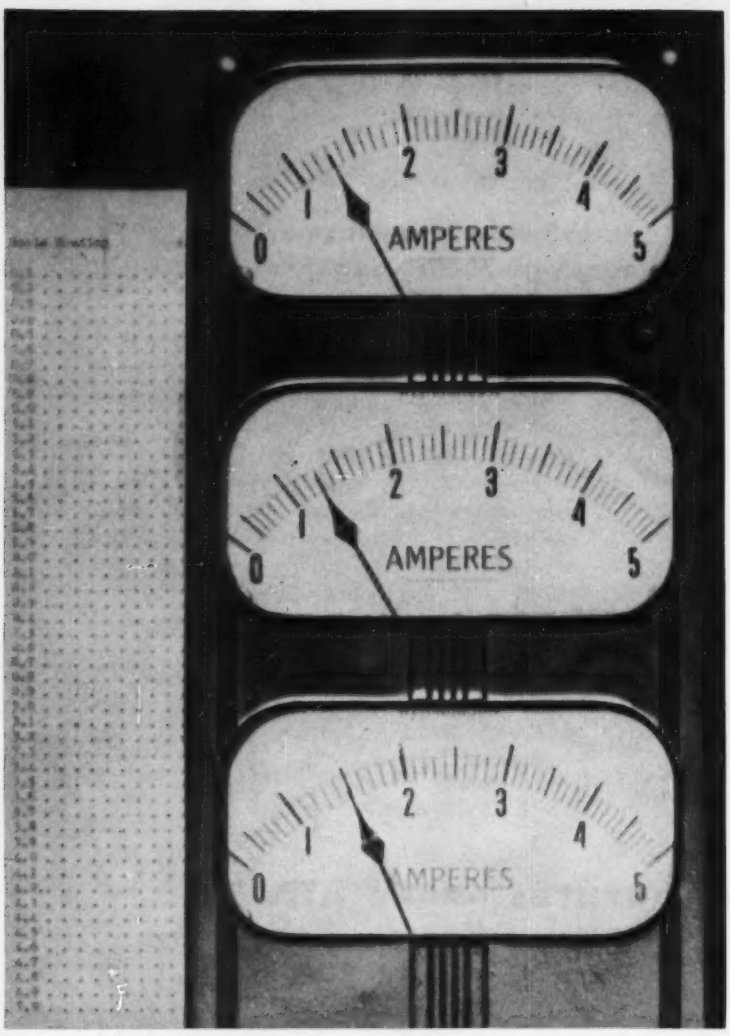
dollar-saving features prove ATANA*

*ALL TRANSFORMERS ARE NOT ALIKE
(make this simple comparison and see)

FEATURE	General Electric	Mfr. A	Mfr. B	Mfr. C	Mfr. D	Mfr. E
Production-line impulse testing	√			√		√
Nitrile rubber gaskets	√					√
One-piece clamping band	√					
H-v and l-v terminals handle both copper and aluminum conductors	√					
Strenicor pressure terminal clamps	√					
Super Melaglyp paint	√					
More than 100 warehouses	√	√				
Nationwide, company-operated service shops	√	√				

Progress Is Our Most Important Product

GENERAL ELECTRIC



For CT Ratio 80/1	
Reading	Amps
.1	8
.2	16
.3	24
.4	32
.5	40
.6	48
.7	56
.8	64
.9	72
1.0	80
1.1	88
1.2	96
1.3	104
1.4	112
1.5	120
1.6	128
1.7	136
1.8	144
1.9	152
2.0	160
2.1	168
2.2	176
2.3	184
2.4	192
2.5	200
2.6	208
2.7	216
2.8	224
2.9	232
3.0	240
3.1	248
3.2	256
3.3	264
3.4	272
3.5	280
3.6	288
3.7	296
3.8	304
3.9	312
4.0	320
4.1	328
4.2	336
4.3	344
4.4	352
4.5	360
4.6	368
4.7	376
4.8	384
4.9	392
5.0	400

SUBSTATIONS—Operation

Rescaling Ammeters is Unnecessary

R. A. ARMISTEAD, Distribution Line & Station Supervisor, Appalachian Electric Power Co, Roanoke, Va.

The expense of recalibrating switchboard indicating ammeters to allow for load growth and changes in current transformers can become sizeable when all stations are considered.

Since World War II the tremendous increase in the use of electricity on the American G&E System has compelled some stations to change station transformers, circuit breakers, and allied equipment as many as three times. Constant rescaling of ammeters to match changes in current transformer has cost considerable time and inconvenience during the changeover.

To eliminate this costly operation, Appalachian Electric Power has for several years rescaled meters, when necessary, for a scale of zero to 5 amp in 1/10 graduations and mounted a conversion table adjacent to each instrument. The tables, also graduated in tenths, show accurate circuit amperes for corresponding meter readings with the current-transformer ratio indicated.

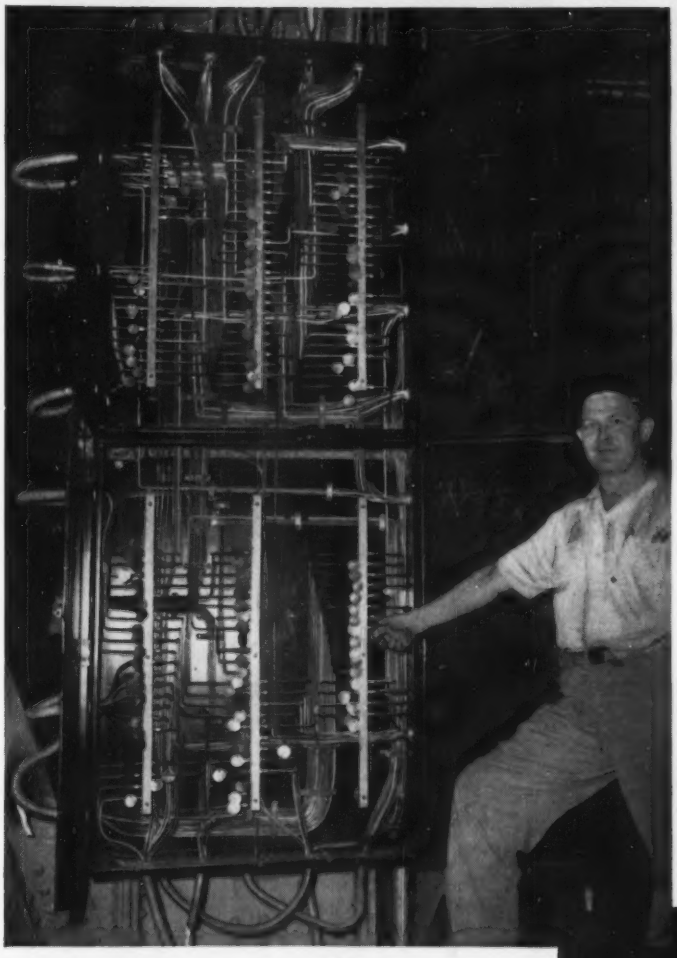
This practice eliminated the expense of removing, shipping, rescaling, and reinstalling indicating ammeters each time the ratios of the station bus or circuit current transformers are changed. It also saves the time and obviates the possible errors incurred by multiplying meter readings by a constant. The only subsequent expense is for replacing the table whenever the ratio of the corresponding current transformer is changed.

The idea might be applied to indicating wattmeters also, if they are provided with either a 1 or 2-kw scale (5 or 10 amp).

(More How To on page 142)

FOR INSTRUMENTATION AND CONTROL

Cabled Tube



Some time ago Revere ran an advertisement featuring Crescent Armored Multitube for use in pneumatic and hydraulic instrumentation and control systems. The advertisement created so much interest that we thought you might like to see a photograph of an actual installation. The Control Board Junction Box shown here has 22 runs of Multitube coming into this box comprising 224 Revere Copper Tubes of 1/4" O.D. The picture was taken in the Glenwood Landing, N.Y. Power Station of the Long Island Lighting Company. The tubes go to instruments that report information on temperature, main and reheat steam pressure, boiler feed and condensate pump pressure, fuel oil and gas pressure, liquid levels, tide level and for the control of fuel feed, draft dampers, boiler drum water level and various control valves.

This is a relatively new use for Revere Copper Tube, but it is an important one in these days when new ways are being found to obtain process information more quickly and accurately, or to achieve automatic control. Crescent Armored Multitube is made by Crescent Insulated Wire & Cable Co., Inc., Trenton 5, N.J., in lengths up to 1,000 feet. It consists of a group of long tubes twisted together in cable form, protected by a flexible interlocked galvanized steel armor, or by plastic, or both. As many as 19 tubes, 1/4" O.D., can be cabled, with one tube in each layer color-coded. Larger tubes can also be cabled, including 5/16", 3/8" and 1/2". This construction affords protection during shipment, installation and use, and speeds up installation greatly. For further information, write Crescent, and for tube in copper and aluminum, see the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

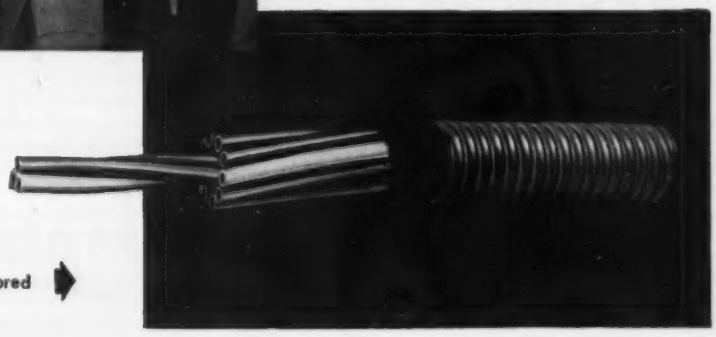
Founded by Paul Revere in 1801

230 Park Avenue, New York 17, N. Y.

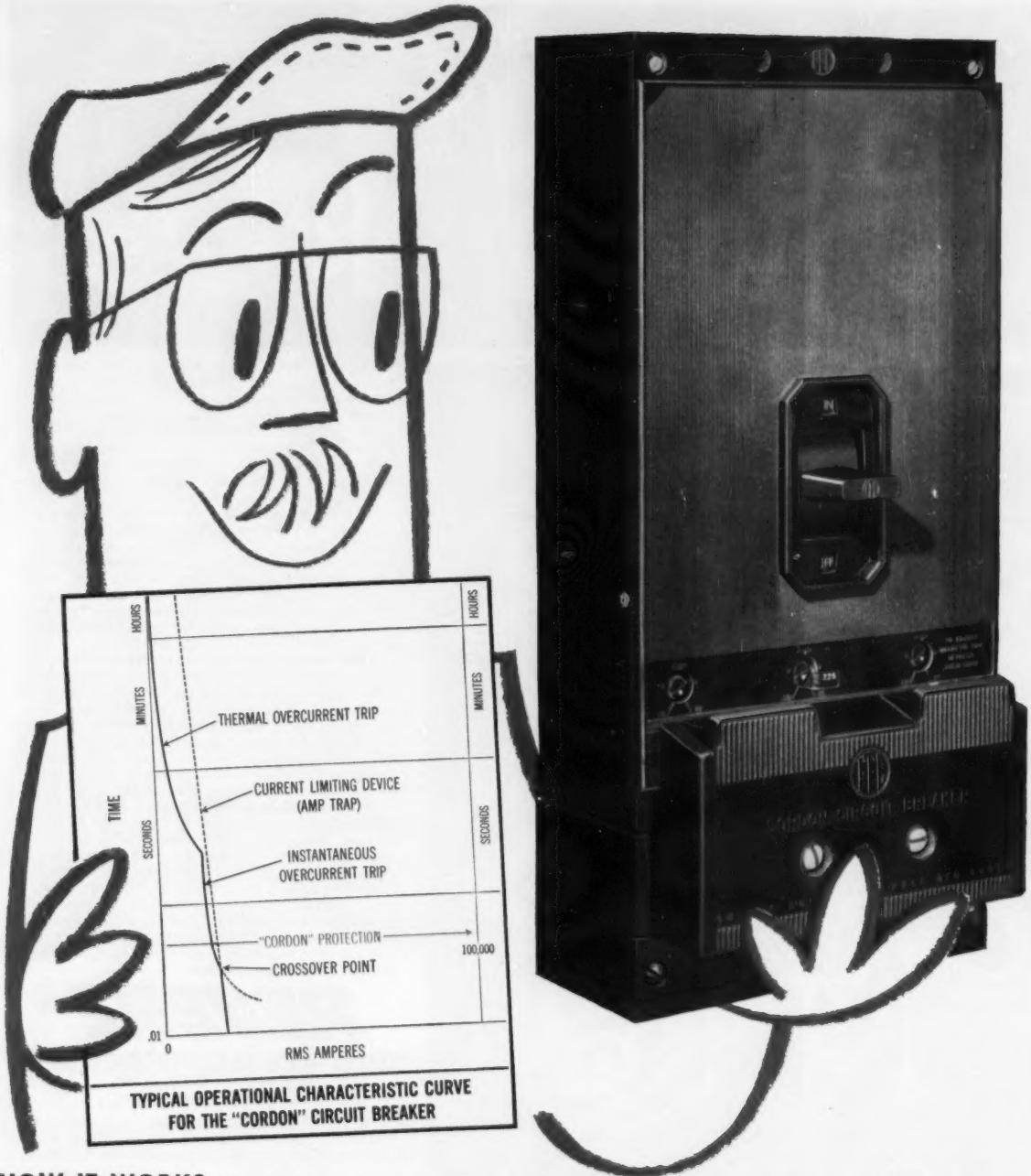
•

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

Control Junction Box at Power Station of Long Island Lighting Company, showing use of Crescent Armored Multitube. Note that relatively sharp bends can be made without damage to the cabled copper tube.



Construction of Crescent Armored Multitube.



TYPICAL OPERATIONAL CHARACTERISTIC CURVE FOR THE "CORDON" CIRCUIT BREAKER

HOW IT WORKS: Combining and coordinating standard circuit breaker characteristics with specially designed current limiting Amp-traps, the "Cordon" circuit breaker achieves the characteristics shown above.

The thermal-magnetic overcurrent devices provide coordinated protection against overloads and short circuits up to a predetermined value (crossover point). At this point the current limiting Amp-traps assume the fault-clearing duty and extend short circuit protection to 100,000 rms amperes.

Unless the magnitude of a short circuit reaches the crossover point, the Amp-traps are unaffected, and the standard circuit breaker overcurrent devices perform their normal function. Since the fast clearing time of the Amp-trap (less than ½ cycle) provides current limiting, the magnetic and thermal stresses, which are proportional to the square of the current, are greatly reduced. Consequently, the standard molded case type circuit breaker safely withstands the heavy fault current. It is unnecessary to design bus-supporting members or current-carrying parts to meet the maximum peak current.

The Amp-traps are mounted in a molded housing which plugs into the load side of the breaker, forming one compact unit. A design feature of the "Cordon" circuit breaker actuates a common tripper bar when any Amp-trap blows, opening all poles of the circuit breaker. Until the blown Amp-trap is replaced the circuit breaker cannot be closed. A mechanical linkage arrangement automatically opens the circuit breaker before the Amp-trap housing is removed.

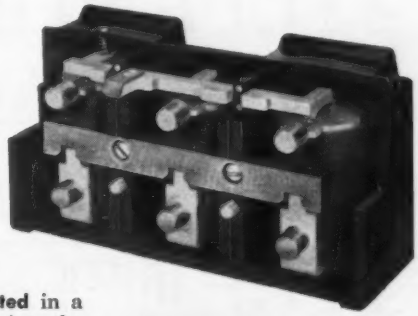
New I-T-E "CORDON" Circuit Breaker

100,000 amp interrupting rating in molded case circuit breakers

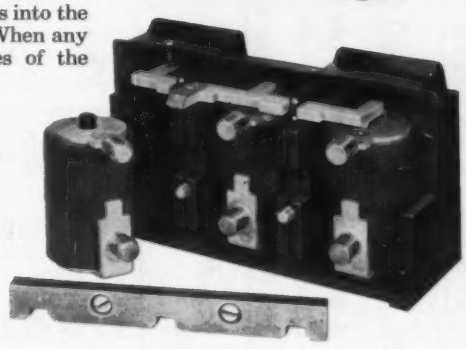
Now—one compact circuit breaker provides the practical, economical solution to meet constantly increasing interrupting requirements. The new "Cordon" circuit breaker provides all of the design and operating advantages of the famed I-T-E molded case breaker, plus interrupting ability up to 100,000 rms amperes.

The "Cordon" circuit breaker can be utilized in normal branch and feeder circuit applications in switchboards, panelboards, load centers and individual enclosures. Plug-in mounting, rear connected studs, or front connected terminal mounting arrangements are optional.

"Cordon" circuit breakers are available with 2 or 3-pole construction in 100, 225, 400 and 600 ampere frame sizes, 250 v d-c and 600 v a-c. Write for complete details or call your nearest I-T-E office. I-T-E Circuit Breaker Company, Small Air Circuit Breaker Division, 19th & Hamilton Sts., Phila. 30, Pa.



The Amp-traps are mounted in a molded housing which plugs into the load side of the breaker. When any Amp-trap blows, all poles of the breaker are opened.



Draw-out design feature of Amp-trap housing provides accessibility to simplify change of Amp-trap. Amp-trap stud design assures proper alignment and positive connection when inserted in the breaker frame.

To replace a blown Amp-trap (indicated by released plunger), simply loosen two screws, remove the retaining bar, withdraw the blown unit, insert the new one, and replace the retaining bar.

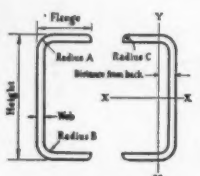
I-T-E CIRCUIT BREAKER COMPANY

Small Air Circuit Breaker Division

Copper Bus Channels: Dimensions, Properties, Ratings

Accompanying data apply to channel-shaped hard-drawn copper bus. They are adapted from a book on electrical conductors issued by American Brass Co.

Section No.	Height, In.	Flange or Leg Width, In.	Web Thickness In.	Corner Radii, In. A	Corner Radii, In. B	Corner Radii, In. C	Cross-Sectional Area of Copper, Sq. In.	Nominal Weight, Lb. per Foot	With Respect to X-X Axis: Moment of Inertia, In.4	With Respect to X-X Axis: Section Modulus, In.3	With Respect to X-X Axis: Radius of Gyration, In.	With Respect to Y-Y Axis: Distance from Back of Channel, In.	With Respect to Y-Y Axis: Moment of Inertia, In.4	With Respect to Y-Y Axis: Section Modulus, In.3	With Respect to Y-Y Axis: Radius of Gyration, In.	CHANNEL SQUARE BUS: D-C Resistance, Microhms per Foot at 20 C (68 F) (a)	CHANNEL SQUARE BUS: Skin-Effect Ratio (b)	CHANNEL SQUARE BUS: 60-Cycle Current Rating, Amperes (c)
1-A	3	1 5/16	0.165	0.409	0.244	0.0625	0.8258	3.18	1.028	0.6856	1.116	0.3844	0.1281	0.1380	0.3939	5.01	1.03	2200
2-A	3	1 5/16	0.216	0.409	0.193	0.0625	1.064	4.10	1.284	0.8558	1.098	0.4016	0.1598	0.1754	0.3875	3.89	1.07	2500
3-A	3	1 5/16	0.284	0.409	0.125	0.0625	1.369	5.28	1.583	1.055	1.075	0.4240	0.1972	0.2220	0.3795	3.02	1.11	2800
4-A	4	1 1/4	0.200	0.463	0.263	0.0625	1.356	5.22	3.059	1.529	1.502	0.5013	0.3788	0.3033	0.5285	3.05	1.07	3200
5-A	4	1 1/4	0.240	0.463	0.223	0.0625	1.612	6.21	3.569	1.785	1.488	0.5148	0.4414	0.3574	0.5232	2.57	1.10	3500
6-A	4	1 1/4	0.338	0.463	0.125	0.0625	2.220	8.55	4.691	2.346	1.454	0.5474	0.5795	0.4819	0.5110	1.86	1.22	4000
7-A	5	2 5/16	0.260	0.464	0.204	0.0625	2.226	8.57	7.888	3.155	1.882	0.6234	0.9675	0.6186	0.6593	1.86	1.15	4500
8-A-T	5	2 5/16	0.339	0.464	0.125	0.0625	2.861	11.02	9.839	3.936	1.854	0.6501	1.204	0.7832	0.6488	1.45	1.25	5000
9-T	6	2 11/16	0.276	0.615	0.339	0.0625	2.872	11.06	14.88	4.960	2.276	0.7629	1.927	1.001	0.8190	1.44	1.19	5600
10-T	6	2 11/16	0.384	0.615	0.231	0.0625	3.932	15.15	19.69	6.562	2.238	0.7992	2.544	1.347	0.8043	1.05	1.34	6300
11-T	6	2 11/16	0.490	0.615	0.125	0.0625	4.936	19.01	23.90	7.968	2.201	0.8343	3.086	1.665	0.7907	0.84	1.63	6800
12-T	7	3 3/16	0.375	0.695	0.320	0.0625	4.569	17.60	31.96	9.130	2.645	0.9261	4.271	1.889	0.9668	0.91	1.36	7300
13-T	7	3 3/16	0.325	0.645	0.320	0.0625	3.999	15.41	28.42	8.120	2.666	0.9061	3.790	1.661	0.9735	1.03	1.36	7000
14 T	8	3 11/16	0.470	0.595	0.125	0.0625	6.638	25.57	60.76	15.19	3.026	1.077	8.233	3.154	1.114	0.62	1.51	8900
15-T	9	4 1/8	0.500	0.625	0.125	0.0625	7.962	30.67	92.81	20.62	3.414	1.191	12.41	4.229	1.248	0.52	1.70	10000



Channel-Square Bus Conductor

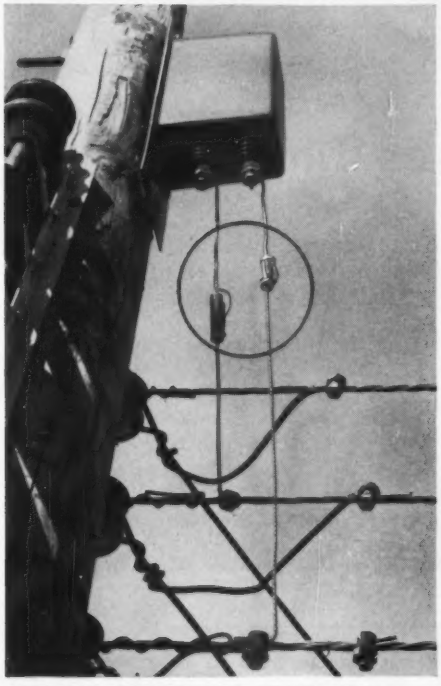
NOTES: Variations from these values must be expected in practice. ASTM Specification B 187, Copper Bus Bar, Rod and Shapes, controls dimensional tolerances, tensile and electrical properties, tests and inspection.

(a) D-c resistance for hard-temper channels corresponding to a conductivity of 98.4% IACS minimum, at 20 C.

(b) The skin-effect ratios are approximate and were derived from the curves for square tubes, Electrical Coils and Conductors, H. B. Dwight, McGraw-Hill Book Co., 1945, page 223.

(c) 60-cycle current-carrying-capacity ratings were computed for 30 C temperature rise over 40 C ambient, bright mill surface finish, the conductor horizontal, in still air, and free from all external magnetic influences, conductivity 98.4% IACS minimum.

When the mercury goes up and air conditioners go on . . .



CHANCE CARTRIDGE TYPE SEMAPHORE FUSES, on a secondary capacitor, completely protect the secondary system and equipment if the capacitor fails, and permit service to be maintained until the capacitor is replaced.

STAY INTACT AFTER OPERATION: Chance Secondary Fuses do not fall apart or hang down after they blow and therefore cannot short-circuit other lines.

CAN BE CO-ORDINATED: For greatest possible protection on your entire system, Chance CTS Fuses can be co-ordinated with primary fuses. Curves showing minimum melting and maximum total clearing time current characteristics are available on request. For performance curves, or more complete information, write to A. B. Chance Company, Centralia, Mo.

. . . your secondary systems should have the protection of

CHANCE CTS indicating fuses

Here's secondary fusing that gives you bargain-price protection from "heat storm" overload problems caused by air conditioning and summer's other increased uses of electricity. Chance CTS Secondary Fuses isolate failed capacitors or faulted sections, protect transformers, and help to maintain customer service—all at very low cost.

A red plastic indicator on the Chance CTS fits tightly against the fuse cartridge until the fuse element ruptures. The flag is then released automatically, and instantly springs away from the cartridge. *Your linemen and patrol crews can easily spot this flag from the ground.*

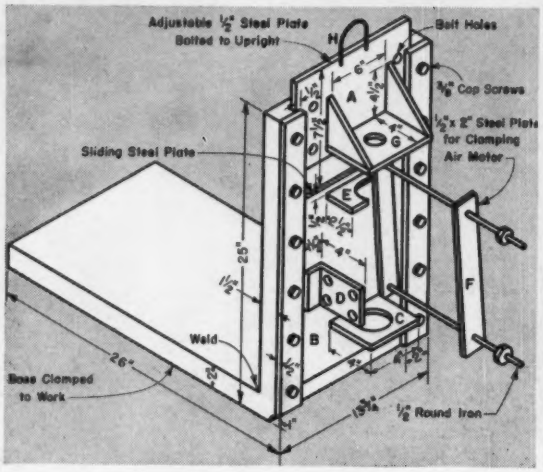
The fuse that WAVES A RED FLAG

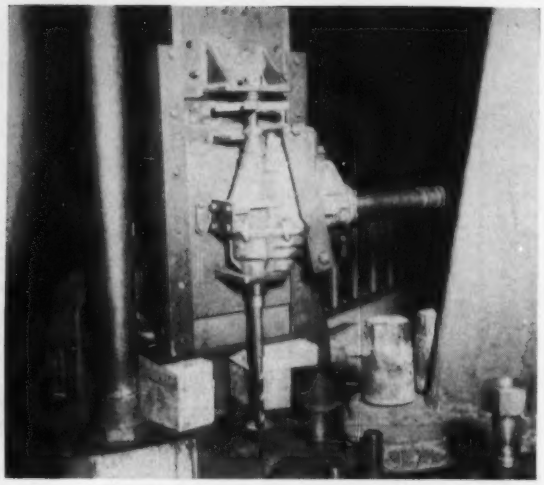
to signal an outage or capacitor failure

A·B·CHANCE CO.

Chance Type CTS Secondary Fuses are available in a complete range of sizes from 5 to 200 amps inclusive. Sold by leading Electrical Wholesalers everywhere.

CE56-11





Accurate on-Job Drilling Saves Time

L. H. CARNIFAX and O. A. HESSON, Appalachian Electric Power Co, Cabin Creek, W. Va.

An adjustable angle-plate holding an air motor has proved to be a convenient time saver at the Cabin Creek plant of the Appalachian Electric Power Co for drilling, tapping, or accurate milling performed away from the machine shop.

This portable accessory is easily clamped where desired. Without sacrificing alignment it is fed by means of a star-wheel directly above the motor. The combination can drill holes up to 2-in. dia and can mill holes as large as 4-in. dia. It is convenient for drilling out a broken bolt in the bottom horizontal joint of a turbine casing.

In the drawing the air motor is set on sliding angle-plate B, with its drill end in hole C, and clamped against pieces of D and E by bar F. Thus the upper end of the motor is directly under hole G. A capscrew is threaded through hole G and attached to the top of the motor casing by a sliding joint, so that rotation of the star-wheel on the bolt feeds the drill.

Upper plate A may be attached to the upright in several positions to extend the feed. Hook H on piece A can be suspended while the drill is being adjusted over the position of the hole. After the exact position has been obtained, the base of the device is clamped securely to the work so alignment is not lost during drilling.

Relay Protects Small Motors

Power plant auxiliary motors under 10 hp served by standard NEMA-rated circuit breakers may be given additional protection through use of simple and low-cost overload tripping relays.

This scheme has been employed by a western utility for circuit breakers for which the smallest tripping element available is rated 15 amp. The relays extend the tripping range of the breaker down to protect motors as small as ¼ hp. Estimated cost of installing this overload trip protection was under $40 per circuit breaker at the time of installation. At one of the utility's steam plants, a number of motors under 10 hp are individually served and protected by circuit breakers equipped with 15-amp overload trip devices. These motors could be protected against overload through installation of manual starters equipped with thermal tripping devices in series with each motor feeder. Cost of installing starters would have been about $50 per motor.

Disadvantages Noted

This solution however, has several disadvantages. Alarm circuits and overload indicating lights would have to be transferred from the circuit breaker contacts to the starter at additional expense. The circuit breaker would have to be tripped by the starter to allow automatic transfer tripping to take place. This wiring would mean an additional cost. Remote resetting provided for many of the circuits would become inoperative with the use of separate manual starters. The starters could not always be located right at the motor, thus adding another piece of equipment to locate and check in case of trouble.

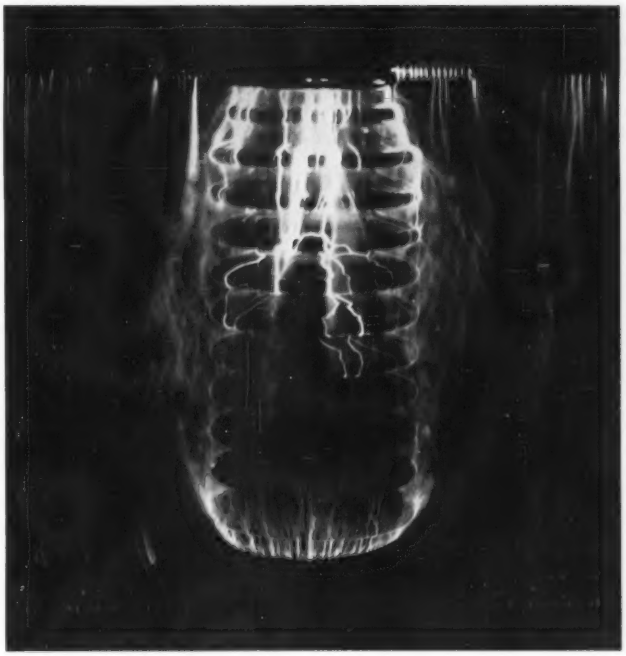
Disadvantages Overcome

All these disadvantages are overcome by the overload relay scheme, whose design and operation has been found satisfactory through test. The scheme uses additional thermal overload relays in two phases of the circuit breaker. These relays energize a

(continued on page 147)

PICTURE OF A KILLER.....STILL AT LARGE IN EVERY THUNDERSTORM

*TC



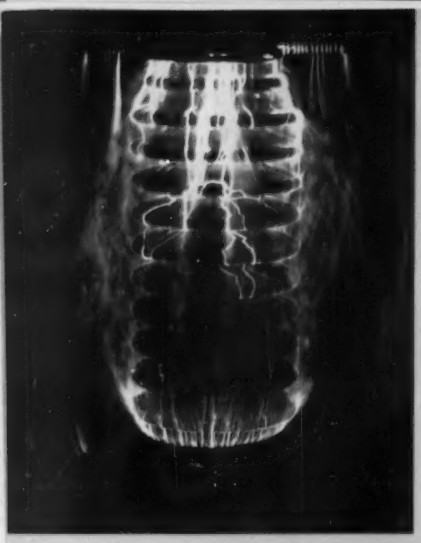
Here is the brief instant of supreme trial for an insulator -- when all the voltage stresses of lightning are built-up and not yet relieved. This is what insulators look like 1/100 millionth of a second before lightning flashover!

In all probability, the pictures on this and the next two pages, recently made in the O-B High Voltage Laboratory, are the first graphic recordings ever obtained of fractional-microsecond pre-flashover corona on a comparative series of conventional 69-kv insulators, under lightning wave-front conditions.

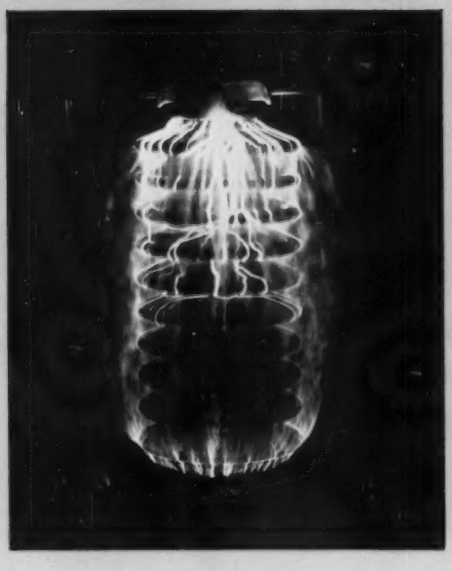
PLEASE TURN THE PAGE FOR MORE OF THE STORY

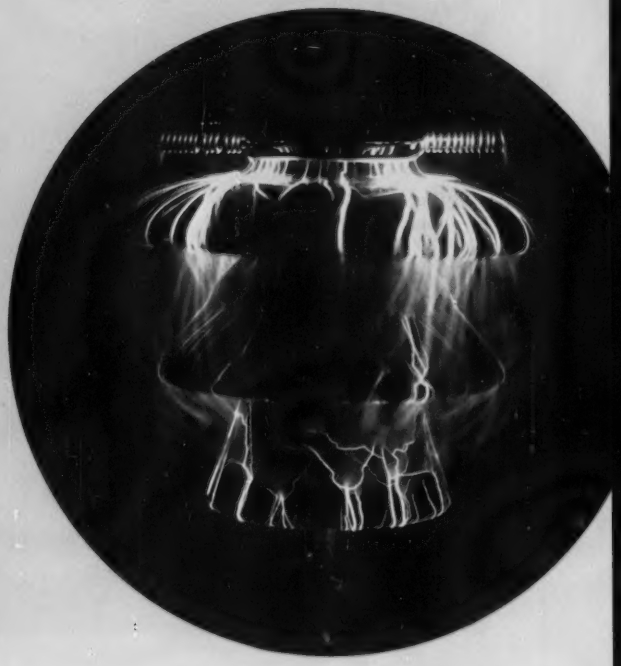
OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

*TECHNICAL COMPETENCE the heart of every Ohio Brass insulator



When a Mere 1/100 Separates the MEN





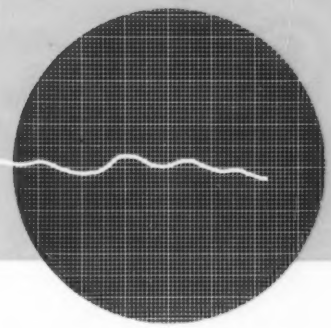
DATA ON THESE TESTS: In the O-B High Voltage Laboratory, great strides have been made in the routine attainment and measurement of ultra-steep-front impulse discharges. On these specimens the wave front was rising at a rate of 8,000,000 volts per millionth of a second (8,000 kv per microsecond). This is in the order of twice the rate of rise normally expected from natural lightning.

In order to eliminate the brilliant discharge and observe fractional-microsecond pre-flashover corona, a parallel rod gap was connected in the circuit and adjusted to fire at approximately 95 per cent of flashover voltage on the specimen. In no case did flashover occur in any of the accompanying illustrations.

From data on wave front and rod gap setting, it is estimated that the conditions depicted here exist 1/100 millionth of a second, or less, before flashover relief, at that instant when the insulator is exposed to maximum electrical stress.

* TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Millionth of a Second from the BOYS

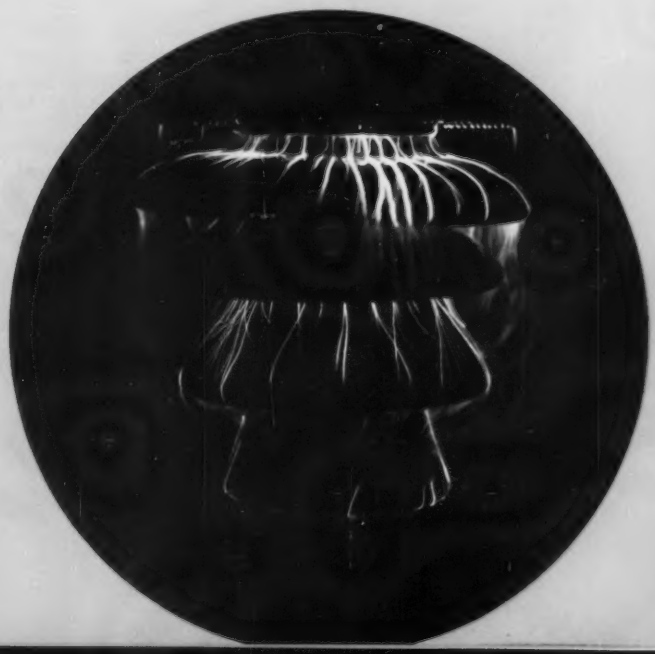


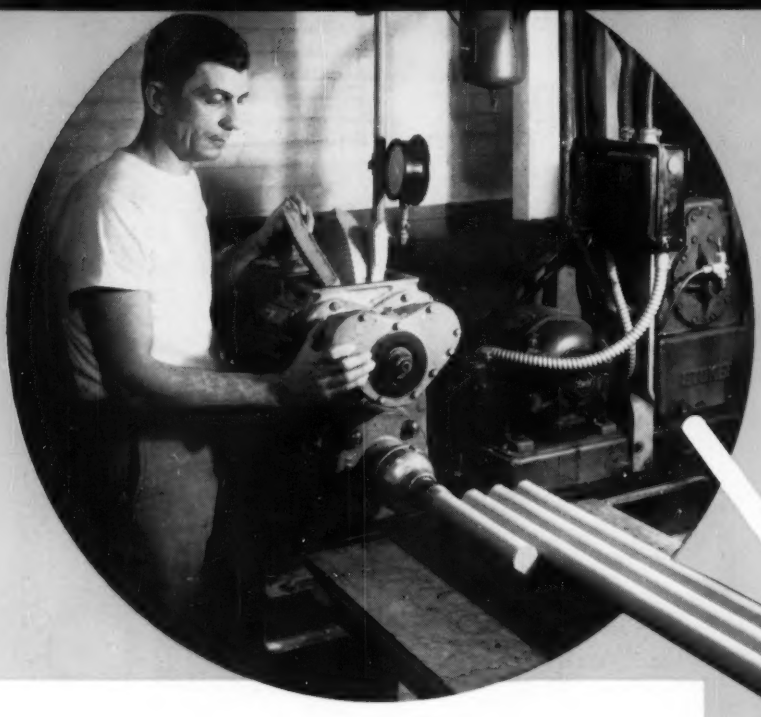
We don't want to disturb your sleep on a stormy night, but did you ever see what your insulators look like when lightning hits? Here is the unimaginably brief period of 1/100 millionth of a second when electrical stresses are at their maximum immediately preceding flashover relief. Here is the time in the history of insulators "when the men are separated from the boys"!

So -- we have finally attained test waves even faster than most natural lightning -- we have finally made them perform in front of a camera -- and we can relate all this to field performance. But what is back of it?

Laboratory procedures such as this are somewhat fabulous in terms of equipment and the quality of manpower. We needn't have this laboratory. We needn't explore these technical frontiers. We needn't do these things, that is, unless we are dedicated to making the best insulator that advanced research can produce.

*TC





We PAY this man to get into trouble

Clay, ready to make into insulators, is sometimes mighty contrary stuff. It "remembers" the screw that expelled it from the Pug Mill and tends to crack in that form when drying. Its loss of volume varies considerably in different directions while drying, followed with additional shrinkage during firing.

Handling the stock, called "pugs," is a tricky business. New products often pose a whole set of new problems. A factory can't work this way.

But, O-B has a rather unique answer -- the Experimental Pilot Plant -- where all operations are performed in miniature. Getting into trouble is their business; likewise getting out of it! When problems go to the factory, they're *solved problems.* When products come out of that factory, they're *good products.*

This is just one of many practical applications of Technical Competence, the heart of every Ohio Brass insulator.

OHIO BRASS COMPANY, MANSFIELD, OHIO
In Canada—Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

4655-H

* TECHNICAL COMPETENCE the heart of every Ohio Brass insulator

Relay Protects Motors

(*Continued from page* 142)

small solenoid which actuates the breaker overload trip bar. The solenoid circuit uses the same 125-v dc control voltage provided for the breaker.

The thermal relays are of the type generally used in magnetic starters, except that their contacts are normally open and they are self-resetting. Approximate range is from 0.5 to 25 amp as determined by the heaters used.

Relays are mounted on the back panel of the breaker adjacent to the outside phases. They are readily accessible for the changing of heaters, which are connected between the breaker's existing overload element and the load terminal. The solenoid is mounted on a bracket extending from the arc chute housing. It actuates the overload trip bar through a short rod.

Solenoid Is Smallest

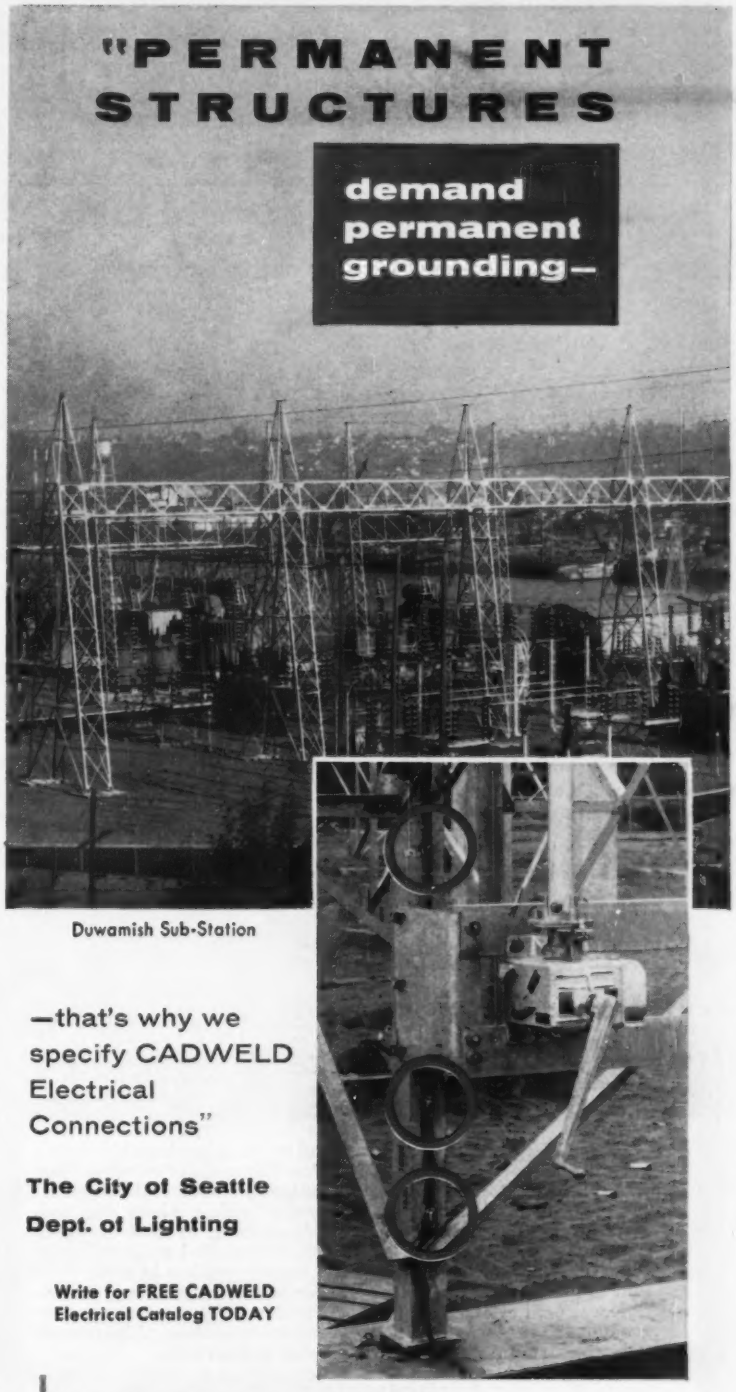
The solenoid is the smallest size readily available. Its operation on 125 v dc using the standard 220-v ac coil is very positive. Because the solenoid is cleared by an auxiliary contact of the breaker, its coil does not have to withstand the dc voltage continuously.

To eliminate the solenoid, consideration was given to using the shunt trip coil of the breaker in conjunction with the added thermal relays. But, it is necessary to actuate the breaker's overload trip bar, which the breaker's overload trip elements actuate, to retain the alarm, indicating light, and remote reset functions. Use of the shunt coil would not retain these necessary functions.

May Be Adjusted Upward

In adding the overload trip relays, the breaker's overload elements are retained for short-circuit protection. The overload relays are self-protecting only up to about ten times their heater rating. However, instantaneous trip value for the breaker's trip elements may be adjusted upwards to any value from one-half the normal rating merely by changing the springs. In practice, the elements are set for instantaneous trip at approximately ten times the rating of the new thermal relays.

(*More How To on page* 148)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demand permanent grounding—
Duwamish Sub-Station
—that's why we specify CADWELD Electrical Connections"
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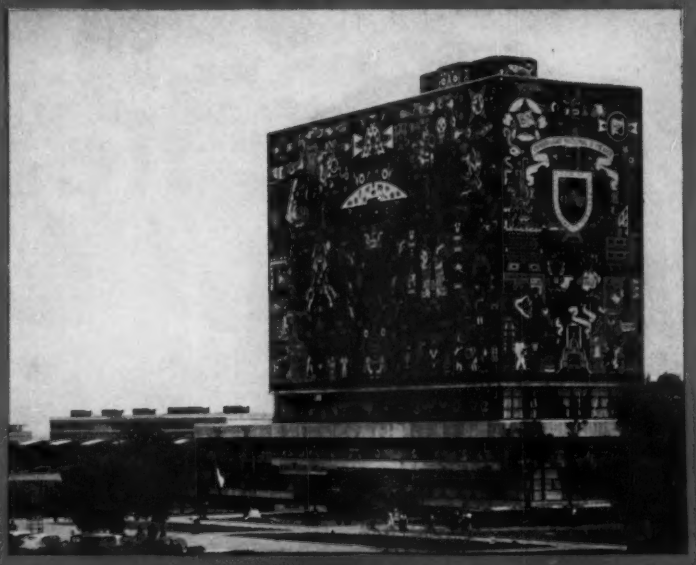
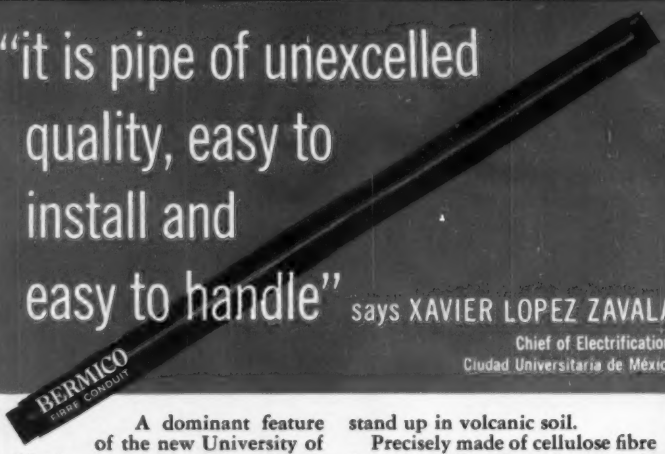
BERMICO® electrical conduit was installed here because.....



"it is pipe of unexcelled quality, easy to install and easy to handle" says XAVIER LOPEZ ZAVALA

Chief of Electrification,
Ciudad Universitaria de México



A dominant feature of the new University of Mexico campus, at Mexico City, is the Library pictured above. Because the campus is built on an ancient lava bed, care had to be exercised in selection of underground materials. That Bermico conduit was used to carry the underground electrical wiring is testimony to Bermico's ability to stand up in volcanic soil.

Precisely made of cellulose fibre impregnated with coal tar pitch, Bermico Conduit is both acid- and alkali-resistant, as well as light, tight, strong, and uniform from end to end—yet low in cost.

For lasting protection of underground wiring systems specify Bermico. Immediate shipment of all sizes and fittings.

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BROWN COMPANY

Berlin, New Hampshire

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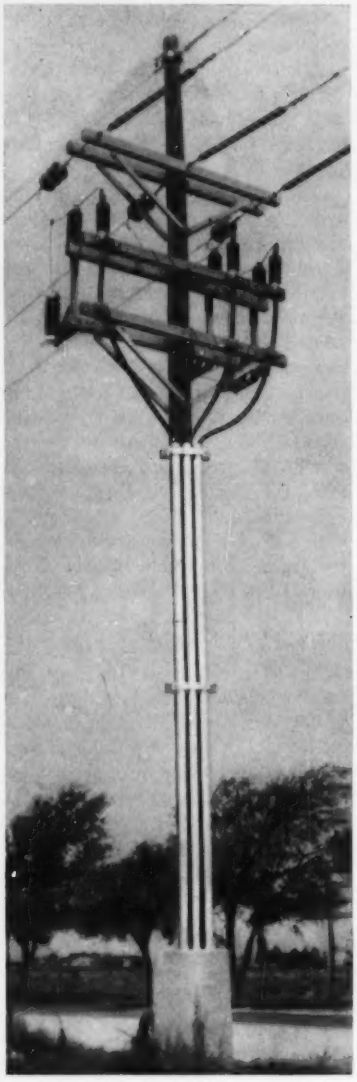


Individual AL Risers Boost Cable Capacity

ROBERT F. McCLURE, Chief Distribution Design Engineer, Southwestern Public Service Co, Amarillo, Texas

Single-conductor cable and individual aluminum conduit risers increase the load-carrying ability of 22-kv, 3-phase take-offs by 19% for Southwestern Public Service Co. The company finds one cable per conduit is easier to install than three cables in one conduit. Individual risers also

(*Continued on page* 152)

25 KVA
distribution transformer

5000 KVA, 3-phase
oil-immersed power transformer

★ Important reason why every CENTRAL TRANSFORMER is of consistent high quality . . . why longer life, uninterrupted performance is assured

Each detail in the manufacture of Central transformers is checked and double-checked against rigid specifications. Not until the chief inspector's final OK is stamped on the tag, is a Central transformer ready for delivery.

It is this exacting inspection, plus careful engineering, finest materials, skilled workers and a modern plant that has won for Central a reputation for the design and manufacture of transformers unexcelled anywhere.

No wonder more and more firms are looking to Central for precision-built transformers. Why don't you discover how Central can serve you?

A type for every need . . . from the smallest to the largest

CTC NEMA **Central** TRANSFORMER CORP.

PINE BLUFF, ARKANSAS
Sales Offices in principal cities.

DESIGNERS AND MANUFACTURERS OF TRANSFORMERS ONLY

VERTICAL OR HORIZONTAL MOUNTING, plus easy addition of a fifth or sixth terminal, illustrates greater versatility.

100-AMP CAPACITY of new square socket makes it the "perfect partner" for use with extended range meters such as General Electric's I-55.

ADVANCED DESIGN of socket and terminal, plus more wiring space, assures easy installation of 100-amp wire.

General Electric Announces . . .

NEW, EASY-TO-WIRE METER SOCKET FOR 100-AMP INSTALLATIONS

General Electric's new extended range square socket has been designed for meter installations requiring 100-amp capacity. The new, low-cost Type S-1 square socket combines extended range capacity with these important benefits:

EASY INSTALLATION of 100-amp capacity wire (up to # 0 gauge aluminum) is assured by greatly increased wiring space. Location of lay-in type terminals requires a wiring bend of only 45°.

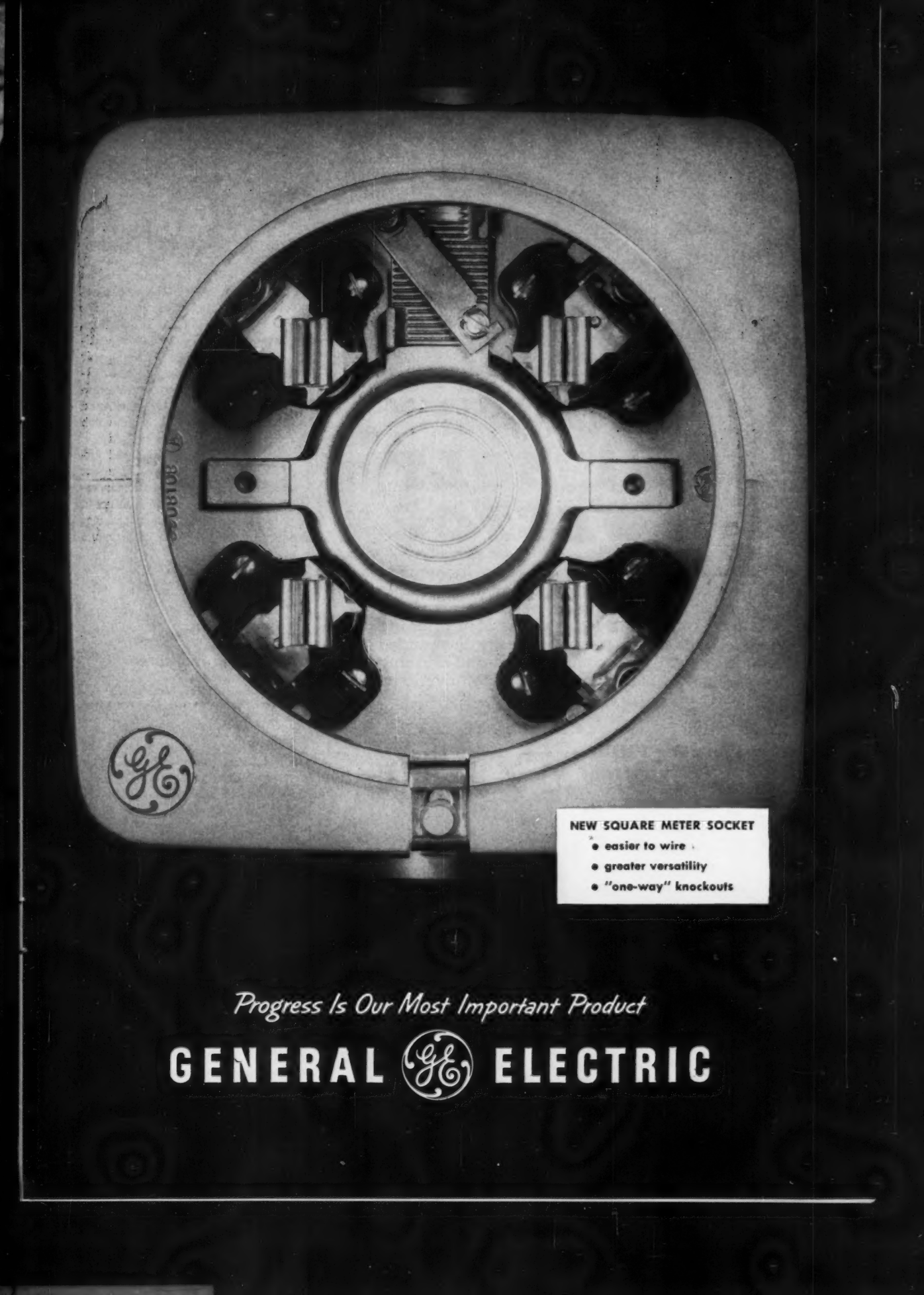
EXCELLENT CORROSION RESISTANCE is provided by die-cast aluminum construction plus baked Glyptal* aluminum finish. Positive, one-way knockouts eliminate any need for prying or bending; unique pre-scoring gives you the exact knockout desired.

QUICK AND EASY ACCESS to the interior is assured by the simple snap-locking device on the socket cover . . . makes removal possible without use of screws or tools.

GREATER VERSATILITY of the new square socket permits either vertical or horizontal mounting simply by interchanging the terminals 90°. Added flexibility may be obtained by the easy addition of a fifth or sixth terminal.

FOR MORE INFORMATION contact your nearest G-E Apparatus sales representative or Authorized G-E Distributor . . . or write for bulletin GEC-1376 to General Electric Company, 625-1, Schenectady 5, New York.

*Reg. trademark of General Electric Co.



Progress Is Our Most Important Product

GENERAL ELECTRIC

Conforms to the standards of the Electrical Service Connector Institute

DOSSON "F" SPLIT BOLT CONNECTOR

Fabricated from high strength alloys (better than average steels), the Dosson "F" is cold-formed for uniform quality. Maximum contact pressure is assured by a high translation of tightening torque. Full length pressure bars with rounded edges prevent load concentration and crushing of conductor. Built to withstand high overload, vibration. Highly corrosion resistant.

Mail coupon for FREE Dosson "F" Connector

UNDERWRITERS' LABORATORIES, INC. LISTED UNDER REEXAMINATION SERVICE UL

DOSSERT MFG. CORP.
249 Huron St., Brooklyn 22, N. Y.

Gentlemen:
Please rush free sample Dosson "F" Split Bolt Connector plus catalog sheet.

Name_____
Address_____ Zone____ State____
City_____

50 YEARS OF TECHNICAL KNOW-HOW

Excl. Canadian Distributor: W. S. Gerrie & Assoc. Ltd.
4158 Dundas St. West, Toronto 18, Ontario

DOSSERT MFG. CORP.
249 Huron St., Brooklyn 22, N. Y.

Risers Boost Capacity

(continued from page 148)

offer much less possibility of damage to adjacent phases in a cable failure.

In the installation illustrated, the cable consists of a single-conductor, 2/0, 27-kv copper cable covered with semi-conducting tape, 43/64-in. rubber insulation, 0.005-in. tinned copper tape, and 7/64-in. neoprene jacket. Outside diameter of the cable is 2.19 in. Individual risers are 3-in. aluminum conduit.

Mountings for the conduits consist of wood arms bolted to the pole. Conduits are held in place with straps bolted to the arms. These installations utilize the chimney effect of the vertical conduits to circulate cooling air over the cables. Air enters at the bottom, is heated, and escapes at the top through a ventilated conduit bell and a slot in the conduit through which passes the eye of the support grip.

Conduits have a bright polished surface. This surface tends to reflect external radiant heat. In summer radiant heat otherwise might produce a copper temperature higher than that produced by energy losses in the cable.

Small Electric Unit Dries Filbert Crop Moisture

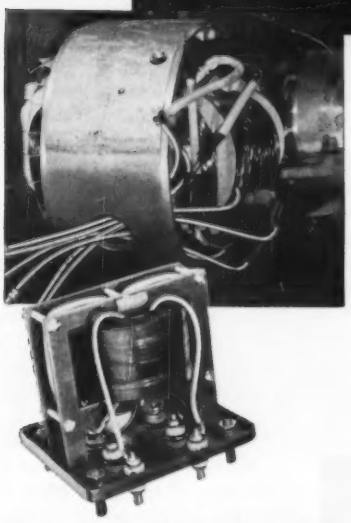
JAMES MacCARTHY, Form Service Supervisor, B. C. Electric Co, Vancouver, B. C.

Solution of nut drying problems for small acreage growers is promised by an electric drier built in B. C. Electric Co's farm service shop, Abbotsford. The unit reduced the 50% moisture content of a year's crop of filberts to less than 10%, based on oven dry weight. Some 200 lb of moisture was removed from 650 lb of nuts in about 63 hr at a cost of about 65¢ per 100 lb of dry weight.

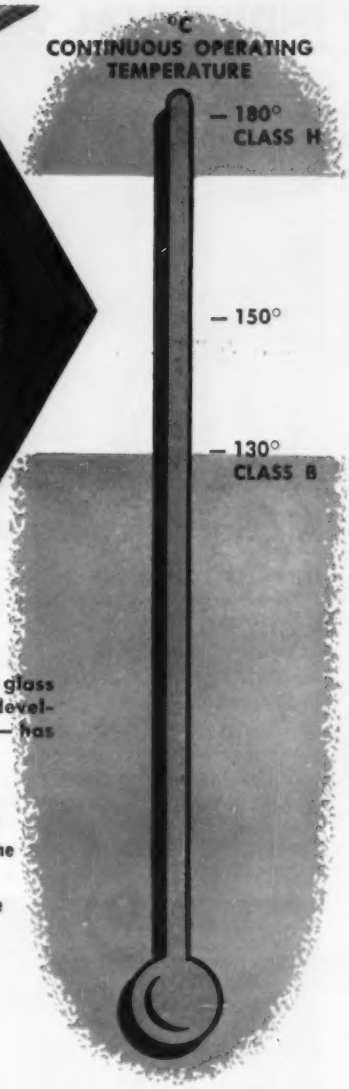
The plywood drier, 8 ft long and 5½ ft high, holds up to 650 lb of nuts. Heat is supplied by a 5-kw thermostically-controlled heater in the bottom of the cabinet. A fan drives the 95-100F heated air up through the nuts. Moisture-laden air is discharged through an opening in the top of the cabinet. As drying progresses, air is re-circulated to conserve heat and heater output.

NEW

NATVAR ISOGLAS® TUBING FILLS THIS GAP



Isoglas tubing is ideal for protecting leads of motors, transformers and other apparatus for continuous operation at 150°C. Where conventional types of coated tubing and sleeving are vulnerable to abrasion or cracking from rough production handling, the exceptional toughness of Isoglas virtually eliminates failures. Potting presents no problems because the film shows no softening or loss of continuity after 15 minutes at 435°F.



Natvar Isoglas tubing—tubular glass braid coated with a newly developed isocyanate type resin—has outstanding

- **resistance to heat**
- **resistance to crazing and cracking**
- **resistance to solvents including the askarels**
- **toughness and abrasion resistance**
- **wet dielectric strength**
- **low temperature flexibility**
- **fungistatic qualities**

NATVAR Isoglas may now be used with great savings by making it unnecessary to use expensive Class H materials to solve temperature problems during the manufacture of products which do not require Class H rating.

Full technical data and samples are available on request.

Natvar Products

- Varnished cambric—cloth and tape
- Varnished canvas and duck
- Varnished silk and special rayon
- Varnished—Silicone coated Fiberglas
- Varnished papers—rope and kraft
- Slot cell combinations, Aboglas®
- Isoglas® sheet, tape, tubing and sleeving
- Vinyl coated—varnished—lacquered tubing and sleeving
- Extruded vinyl tubing and tape
- Styroflex® flexible polystyrene tape
- Extruded identification markers

Ask for Catalog No. 23

NATVAR CORPORATION

FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE
RAHWAY 7-8800

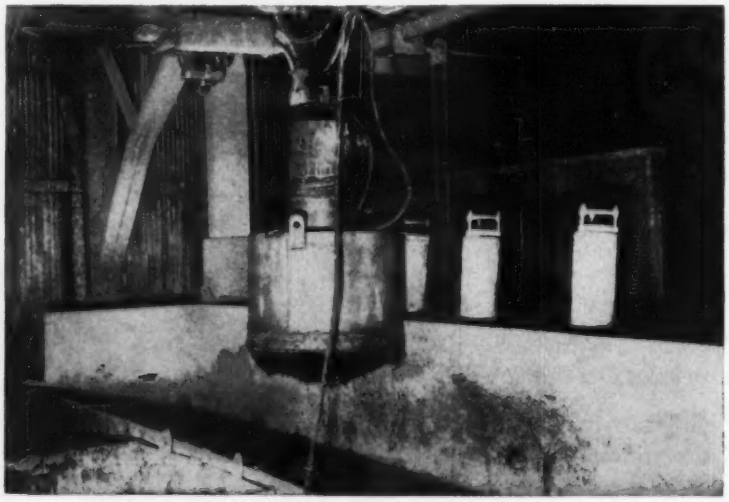
CABLE ADDRESS
NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY

Air Conditioner Keeps Knitters Clicking

LEON ALBERTSON, Market Studies & Service Division, Philadelphia Electric Co, Philadelphia, Pa.

An air conditioning system is keeping West Grove Hosiery Mills, West Grove, Pa., humming at top efficiency. By holding temperature at 80F, a 25-ton unit prevents excessive expansion and contraction of metal parts in high-speed precision-built knitting machines that turn out "nylons" for women. By keeping humidity at 50%, the air conditioner also helps prevent stretch and shrinkage of nylon yarn, thus keeping stockings uniform in size and shape. The company will reap an additional benefit in employee morale due to the comfortable working conditions, especially if this summer produces the same torrid heat of past several summers.



Lifting Magnet Saves 60 Manhours Work

The time required to clean a pipe descaling tank has been cut from 64 manhours to four by this 39-in.-diam. all-welded lifting magnet. Used in the pierce and draw department of Babcock & Wilcox Co, Barberton, Ohio, the magnet's electrical leads are encased in a special jacket for protection against the hot caustic solution. Formerly the 5 x 28-ft tank was cleaned manually, taking 64 manhours.—Electric Controller & Mfg Co.

Shift to New Plant...

is averted by printing firm by replacing drying racks for silk-screened material with a conveyorized oven

G. C. WAGNER, Industrial Engineer, Union Electric Co of Missouri, St. Louis, Mo.

A specially made conveyorized drying oven has solved a space problem in a Midwestern printing plant. Freshly silk-screened material formerly was racked for air drying after emerging from the printer. Output, however, had grown to such an extent that a move to larger quarters seemed necessary to accommodate the growing number of drying racks.

Drying Racks Wasted Space

Discussions with district industrial engineers revealed that more efficient use of the present floor area could postpone or perhaps eliminate the costly move. Forced drying of the printed material would eliminate the drying racks which were eating up floor space.

No proven commercial equipment for this specific job was on the market at the time. A utility industrial heating specialist and several district engineers worked closely with a local equipment manufacturer to develop and produce a conveyorized oven to do the job.

Several ovens were installed in the printer's shop, totaling about 100 kw. Close cooperation of members of the Industrial Sales Department with the equipment manufacturer and the customer during the shakedown period solved problems in oven design, methods of operation, and types of printing materials used. As a result:

One Oven Less Required

- The present number of ovens is one less than initially planned. Production capacity per oven was greater than expected, allowing existing ovens to absorb the load intended for the extra oven.
- Floor space is no longer a problem.
- The saving in man-hours required for total plant output is more than twice the cost of energy consumed by the ovens.

Anaconda specifies Enjay Butyl rubber

TO DEFY OZONE IN HIGH-VOLTAGE CABLES...

for more current per circuit... more power per dollar

Anaconda specifies Enjay Butyl insulation for high-voltage cables because this rubber has incredible resistance to ozone. Surpassing the industry's standard three-hour specification test, Enjay Butyl insulation used by Anaconda showed *no injury after 72 hours* of ozone concentration tests—24 times longer than specification requirements. Other rubbers would deteriorate and crack in a fraction of this time.

With the help of Enjay Butyl, millions of feet of Anaconda's cable now in use deliver more current per circuit, more power per dollar.

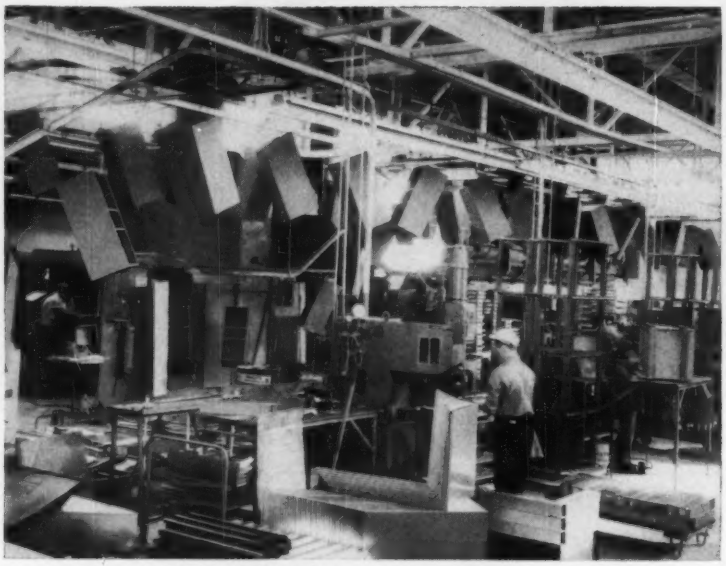
Perhaps *your* product, too, can be improved with versatile Enjay Butyl. It comes in non-staining grades for white and light-colored parts, offers excellent electrical properties, low price and *immediate availability*. For full information, contact the Enjay Company. Complete laboratory facilities and technical assistance are at your service.

ENJAY BUTYL

Enjay Butyl is the super-durable rubber with *outstanding* resistance to aging • abrasion • tear • chipping • cracking • ozone and corona • chemicals • gases • heat • cold • sunlight • moisture.

ENJAY *Pioneer in Petrochemicals*

ENJAY COMPANY, INC., 15 West 51st Street, New York 19, N. Y.
Other offices: Akron • Boston • Chicago • Los Angeles • Tulsa



TABULATING MACHINE ACCESSORIES are conveyed through a dip bath or spray booths at floor level, then hoisted to overhead oven for infrared drying

Infrared Ovens Save Labor

E. F. DILLARD, Power Salesman, Worcester County Electric Co., Worcester, Mass.

Savings up to 50% in labor and materials are credited to infrared electric drying of painted metal tabulating machine accessories at the plant of Wright Line, Inc., Worcester, Mass. These products call for a gray baked synthetic enamel finish, either plain or wrinkled, to match modern office furniture.

The three conveyorized paint lines have variable speeds ranging from 1 to 15 fpm. Parts are sprayed in two of these lines and dipped in the third.

The dip line is almost completely automatic, requiring only two men. One man hangs the unpainted pieces on the conveyor and the second removes the dry, finished pieces at the end and packs them for shipment. This line forms a loop about 200 ft long. The loading and unloading points and the dip tank are at floor level.

The oven itself is made up of four 1,500-w and 28 1,800-w radiant units mounted in a sheet metal tunnel about 48 ft long. Accurate temperature control is afforded by two input controllers. This tunnel is used for small assembly pieces varying in weight from 4 oz to 6 lb each.

Larger pieces up to 75 lb each are painted in spray booths and dried in lamp-type infrared ovens. One oven has 448 375-w lamps and the other has 420 500-w lamps. Each oven is divided into six sections. Each section may be operated at full or reduced voltage to provide a wide heating range. The hanger supporting each piece is swiveled, and by using a friction drive, the piece is slowly rotated as it passes through the tunnel.

Each of the three ovens is mounted close to the ceiling. This permits cleaner operation and consequently a higher finish quality. It also releases at least 1,500 sq ft of valuable floor space. In the bottom of each tunnel is a panel which easily slides out of the way for service work. In each line, the paint is piped under pressure from a paint storage room to the point of application.

Henry Wright, chairman of the company's board of directors, states that another 150-kw infrared unit has been bought for a fourth line. This new line will combine the best features of the other three lines. It will be designed for use either with a dip tank or spray booth, and may be used with the smallest or the largest parts.

Butt welding wire with a compact 3-kw unit saves rethreading wire drawing machines at National Wire Products Co, Baltimore, Md. This wire, used in the fabrication of steel mesh for the construction industry, is drawn down before being electrically welded to make the final product. Butt welding the ends of individual rolls not only speeds production but also is quick, easy, and economical. The wire ends are inserted in special jaws on the welder. The operator steps on a treadle and in a flash a powerful weld is completed. W. W. Clouse, Industrial Representative, Baltimore Gas & Electric Co, Baltimore, Md.

Keeping sodium in the liquid state as it flows through pipelines of U. S. Industrial Chemical Co's Ashtabula, Ohio, plant is done with electric heat. Sodium is kept between 250 and 270F outdoors by passing current at 110 to 120 v through ¼-in. iron pipe suspended about an inch below the sodium line. Indoor lines are warmed by tubular heaters rated from 250 to 1,000 w. They are clamped to the underside of the pipe and are operated at half-rated voltage. The company designs for 30 watts per lineal foot on indoor pipe, and slightly higher for outdoor runs because of weather extremes. When a cold spell hits, the pipe temperature is adjusted easily by stepping up the voltage slightly. Paul T. Bohn, Writer, The Cleveland Electric Illuminating Co, Cleveland, Ohio

Supplying steam to 10 irons used in the dress manufacturing building of Bob-Ellen Sportswear Co, Wilkes-Barre, Pa., is done electrically with a 25-kw steam generator. Although the initial cost was higher than for a competitive unit, it was decided that savings in long pipe runs would offset much of the investment in the electric unit. Furthermore, the customer was shown that the unit's demand could be cut in half effectively by a time switch used to start the boiler just before the on-peak period. This helps hold the power bill down. After initial heating, the unit operates intermittently depending upon load. The customer now considers this unit the most efficient and automatic in his plant. Art Van Horn, Industrial Representative, Pennsylvania Power & Light Co, Wilkes-Barre, Pa.

COPPER gives you more to talk about

Are you in a business whose product needs constant selling? Most products do.

Perhaps yours must be sold to many people . . . your own sales organization . . . distributors, retailers, consumers.

Copper gives you more to say for your product.

And especially where you're selling against competition, *copper can make the difference.*

For no substitute possesses the combination of characteristics you get . . . and offer . . . in copper and its many versatile alloys.

Today, as always, the phrase "made with copper" signifies *quality.*

That's because people's experience with copper is favorable. There is no doubt about copper's performance.

If mere acceptance isn't enough for your product . . . if competition makes *preference* important . . . give yourself the advantage of copper or one of its many alloys.

You will find that COPPER gives you more to talk about—*helps you sell!*

COPPER & BRASS
RESEARCH ASSOCIATION

420 Lexington Avenue, New York 17, N. Y.

. . . AN INDUSTRY SOURCE OF TECHNOLOGICAL AID, INCLUDING A LIBRARY OF TECHNICAL LITERATURE AND A COUNCIL OF SPECIALISTS

COPPER OR ITS ALLOYS PROVIDE THESE ADVANTAGES:

Best conductor of electricity commercially available

Does not rust . . . high corrosion resistance

Best heat transfer agent of all commercial metals

Easy to machine, form, draw, stamp, polish, plate, etc.

Welds readily . . . excellent for soldering and brazing

Compare pole top appearance!

KPF SWITCHES

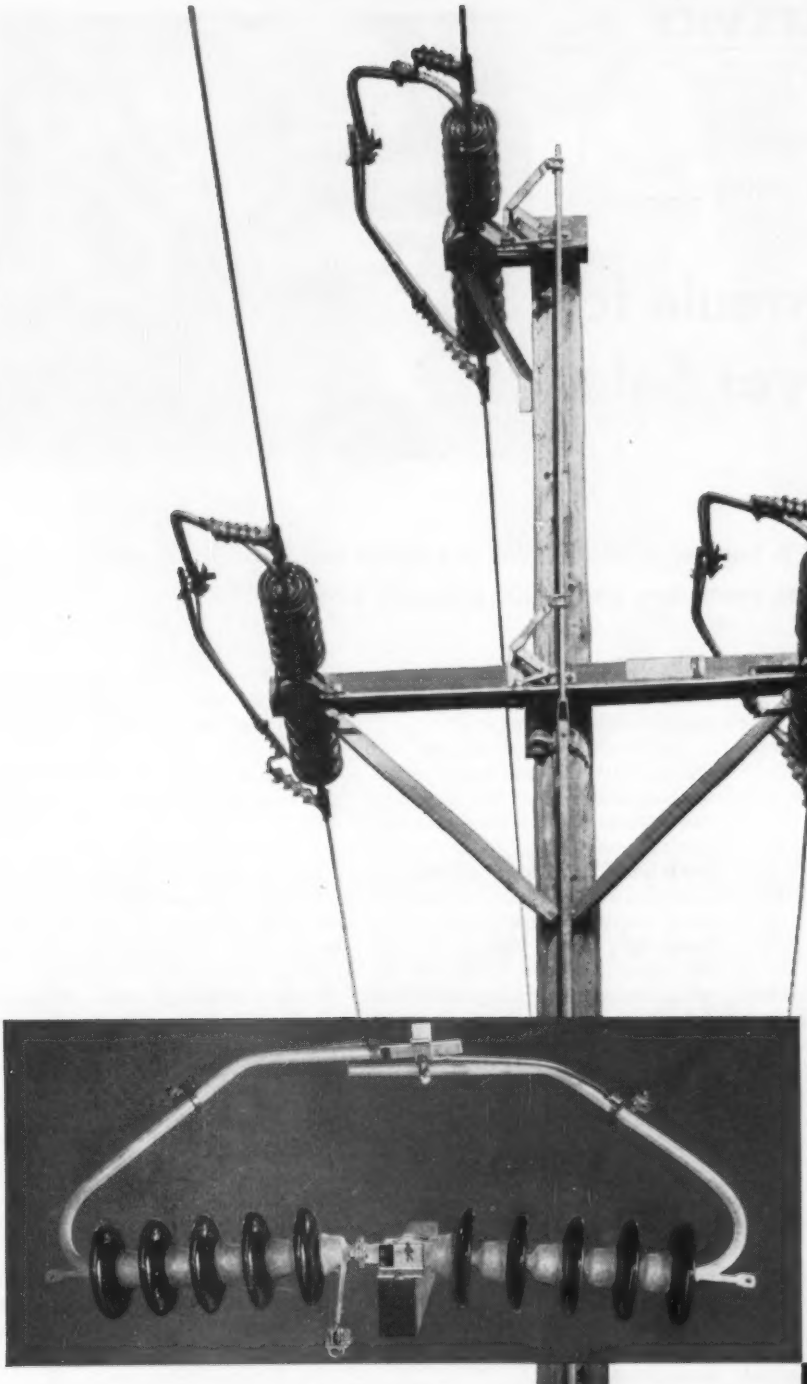
modern
functional
attractive

Their simple design means long, trouble-free service

KPF Air Break Switches look different because they are different. Their pole top appearance is neat, uncluttered. There is "straight-through" cleanliness of line—the visual appeal of design simplicity. With this simplicity goes unmatched operating dependability and long life. In KPF Switches, there are no delicate complex mechanisms to malfunction, freeze, lock from cross-arm warping, need lubrication or wear out.

KPF Switches have proved themselves in nearly a half century of operation on major systems. Why not get the details, make a test installation.

For catalog and complete specifications, write direct



The simple construction of KPF Switches saves weight. Phase units weigh almost the same as ordinary insulator stacks. Double cross-arms and extra bracing are not required. Installation is not only faster, but less expensive. KPF Switches are available for service 7.5 to 110 kv and amperage 200 to 600 amperes. Shown is a 60 kv installation.

KPF ELECTRIC COMPANY

Dept. E. 1624 E. Alpine Avenue
Stockton 5, California

KPF

AIR BREAK SWITCHES

Standard for nearly half a century

3387

Free Cosmetics at Dealer Demonstrations Give Utility . . .

Beauty Formula for Range, Dryer Sales

Columbus & Southern Ohio Electric ups range sales 185%, dryers 105% in 6-week promotion; gets 7,000 prospects $14,100 EAR

A Winter Range Festival that featured free cosmetics at dealers' open house demonstrations reaped these benefits for Columbus & Southern Ohio Electric Co:

- Range sales upped by 185% over a comparable 1955 period.
- Dryer sales boosted by 105%.
- $14,100 new EAR in six weeks.
- Appliance prospect list of more than 7,000—3,107 for ranges, 1,555 for dryers—collected by dealers. Some 20,000 visited open houses.
- Accolades of participating dealers.

Here's how the Festival worked: From Feb. 13 to March 24, dealers staged range demonstrations staffed by C&SOE home economists and dealer representatives. After the open houses, housewives registered and received free cosmetics that were selling in downtown stores for $5.25.

The utility spurred interest with almost 100,000 lines of newspaper advertising (dealers used 38,000 lines at their own expense), window and floor displays, radio and TV commercials. Other methods: Point-of-sale material, open house demonstrations, "Electro-buck" salesman incentives, new suit to dealer with the best tie-in advertising. The company billed dealers for the wholesale cost of the cosmetics, then rebated about half of this for each filled-out registration.

The dealer reaction? George Marburger, manager of Cook Furniture, put it this way: "Your range promotion this year was the best you ever produced. We sold four ranges on the day of our demonstration and six of them since then."

Westgate Electric Co Manager Don Rice said, "I've never seen a promotion that built such store traffic. Let's have more of this type of help."

Said Kenneth M. LaRue, C&SOE sales promotion manager: ". . . benefits in the nature of sales directly connected with this promotion will be coming for many months."

Actual campaign costs, he said, could be narrowed down to the cosmetics and point-of-sale material since the ads, TV and radio programs are under contract. About $7,000 was spent, or 50¢ per EAR dollar.

'Snowballing Profits' Is Philadelphia Housepower Theme

Electric Association of Philadelphia is playing the theme contractors and dealers like to hear . . . profits.

Booklets entitled "Keep Your Profits Snowballing" have reached both groups with messages on the "100-A Housepower" campaign and its initial stories of success last year (EW, May 20, 1955, p 144).

Contractors, for a participation fee of $15, get these selling aids:

- Name and address in four 1,500 line ads in three Philadelphia papers.
- Full refund of the $15 fee on basis of $5 for each of first three 100-A jobs installed.
- One night sales course.
- Shop and window posters, hand-outs and decals.

The association points out that in just one year of its first "100-A" campaign 413 contractors reported more than 40,000 wiring improvements, not counting new wiring needed for new appliance installations.

Big ads, cooking schools, and its prize-winning housewares activity will be included in the association's promotional work. Philadelphia Electric Co is tying in with a financing plan for wiring jobs under $120, ads in all media, and establishment of a home wiring advisory service.

The 100-A program for dealers is similar to the one for contractors. It consists of four parts:

1. Name and address listed in four 1,000 line ads featuring appliances in three Philadelphia papers and display and promotional hand-out material for $15.

(*Continued on page* 162)

FOR BATHROOM OR KITCHEN

LOW priced AUTOMATIC Cavalier® ELECTRIC HEATERS

Absolutely NEW! Most ADVANCED! STAINLESS STEEL and ALUMINUM!

Sell constant warmth at budget price! Cavalier's new automatic bathroom heater never lets the room get cold—never wastes current in overheating. Accurate thermostat insures constant comfort. And Cavalier bathroom heaters are priced low. Your customers will be surprised that automatic bathroom heat costs so little—gives so much extra convenience.

BUILT TO STAND THE HEAT AND HUMIDITY OF BATHROOM USE. Stainless steel exteriors and solid aluminum reflectors of Cavalier bathroom heaters will literally last a lifetime. Rugged construction for lifetime usage—a feature your customers can see for themselves.

AUTOMATIC THERMOSTAT CONTROL. No more waiting for room to warm up. Cavalier automatic bathroom heaters give constant comfort. Superior quality, liquid-filled thermostat gives quick, positive response to slight temperature change. Designed for four times as much load as it actually carries. Sensitive and accurate control means comfort without waste—a plus value your customers can't overlook.

FLUSH WITH WALL. Space-saving wall insert design that makes a completely flush installation. Trim and smart looking, with lasting beauty of stainless steel and aluminum! Cool-edge exterior grille permits use with plastic tiles as readily as with ceramic tile. Grille is easily removed for cleaning. Cavalier offers more good reasons why your customers will be completely satisfied for years to come.

BRIGHT, SOLID ALUMINUM REFLECTORS for a maximum of sunny, radiant warmth. Aluminum reflectors are not heat absorbent—they project all the heat into the room. Your customers get all the heat they buy.

SELL WITH CONFIDENCE THAT YOU OFFER THE FINEST. All the genuine Cavalier quality . . . Cavalier design . . . Cavalier manufacture . . . at budget price! Show and sell the newest and hottest. It's Cavalier . . . a respected name since 1865.

1 . . . 2 . . . 3 . . . you'll agree! *These heaters will be among your most called-for items!*

See your distributor or write Electric Heating Division, Cavalier Corporation, Chattanooga 2, Tennessee.

The Old Reliable

EVERSTICK ANCHORS...

EXTRA Holding Power
QUICKLY Installed
TOUGH For long life

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing. Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
Manufacturers of "THE ANCHOR OF MERIT"
FAIRFIELD, IOWA

Snowballing

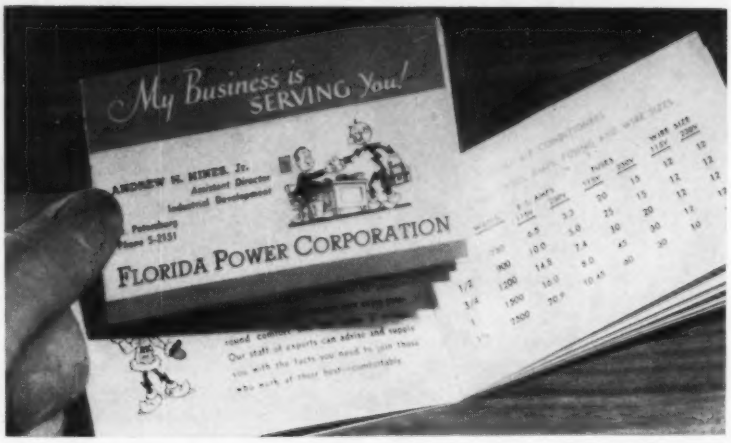
(*Continued from page* 160)

2. For $15, name and address in two 1,000 line ads spotlighting washers, dryers, and water heaters. Also, window and store display material on these three appliances plus payments of up to $50 for showroom floor installation of dryers or water heaters based on $10 for each sale during the campaign.

3. Three dinners at association headquarters which include a concentrated sales-builder course for $5.

4. "No Soap Opera," a sales-making appliance demonstration in the dealer's store, for $25.

The association reminds dealers that last year's Housepower promotion added enough "electrical room" for more than 25,000 new appliances. They say, "Join the gang—and keep your profits snowballing!"



'Calling Card' Sells Florida Power Aids

ROBERT N. ROBERTSON, Assistant Director of Advertising, Florida Power Corp, St. Petersburg, Fla.

A new "calling card" that acts as a selling tool as well as to give the commercial or industrial representative's name has been devised by Florida Power Corp. Comments on the cards have been favorable, and customers are keeping them for future reference.

The new calling card is about the size of a standard one, but is in the form of a small 16-page booklet. On the front cover is the representative's name, title, phone number, and company. The inside pages contain information on different services the company provides, including help with lighting, air conditioning, cooking, wiring, refrigeration, and heating. Tables are also included of motor characteristics and wiring requirements and for characteristics of refrigerants.

Cartoons of Reddy Kilowatt are used on the cover and within the booklet to lighten up the presentation.

S & S SHORTS

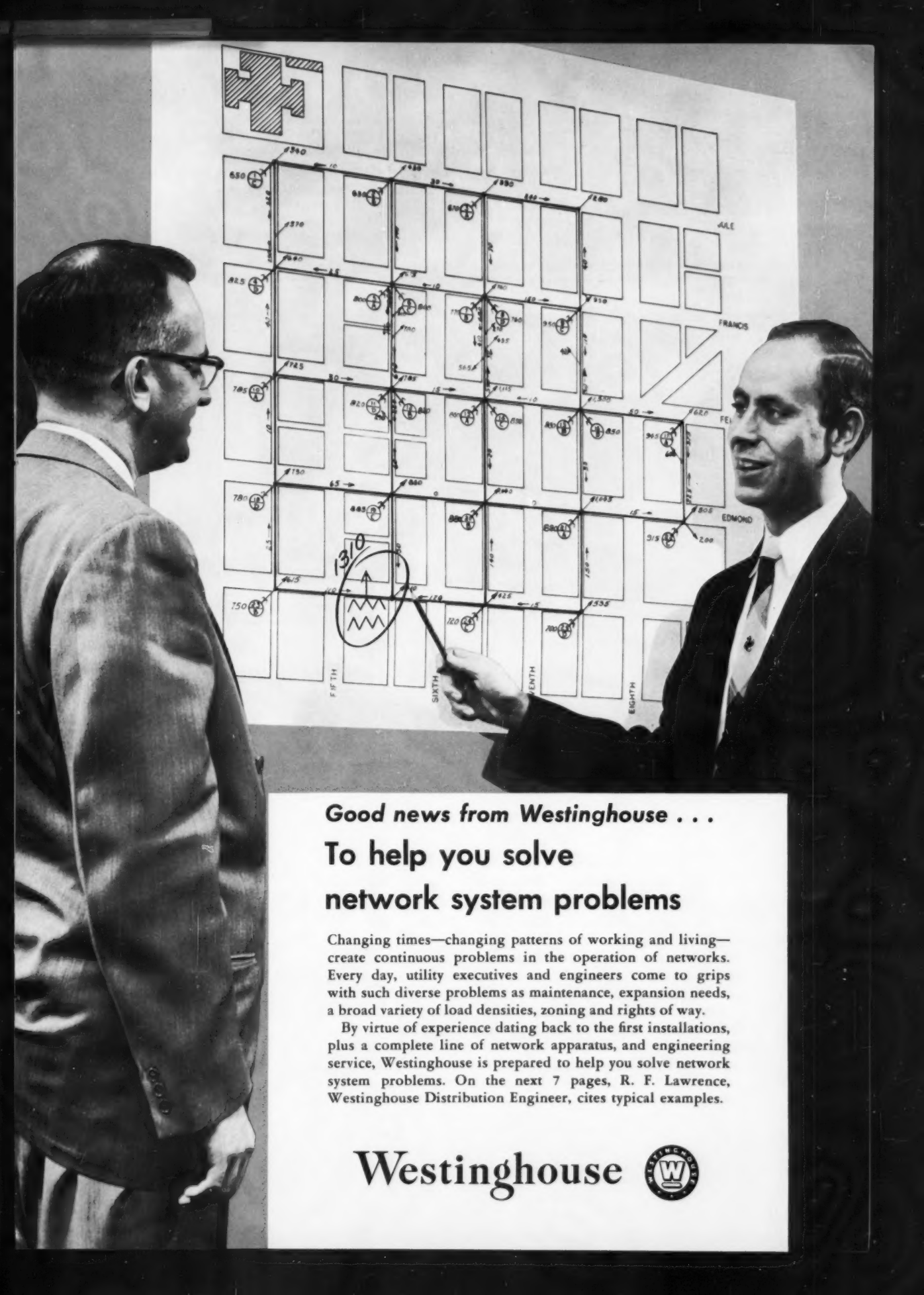
What's Farmers' Big Cost?

More than half of U. S. farms' labor costs result from man-handling of farm materials, says Research News. And, Implement & Tractor estimates over a third of total cost of nation's farm output comes from materials handling operations.

Food Service to Double by 1970

Estimate quoted in Food Service magazine says food service industry, which now sells $16 billion in food a year, will grow to $35 billion in 1970.

(*More S & S on page* 171)



Good news from Westinghouse . . .

To help you solve network system problems

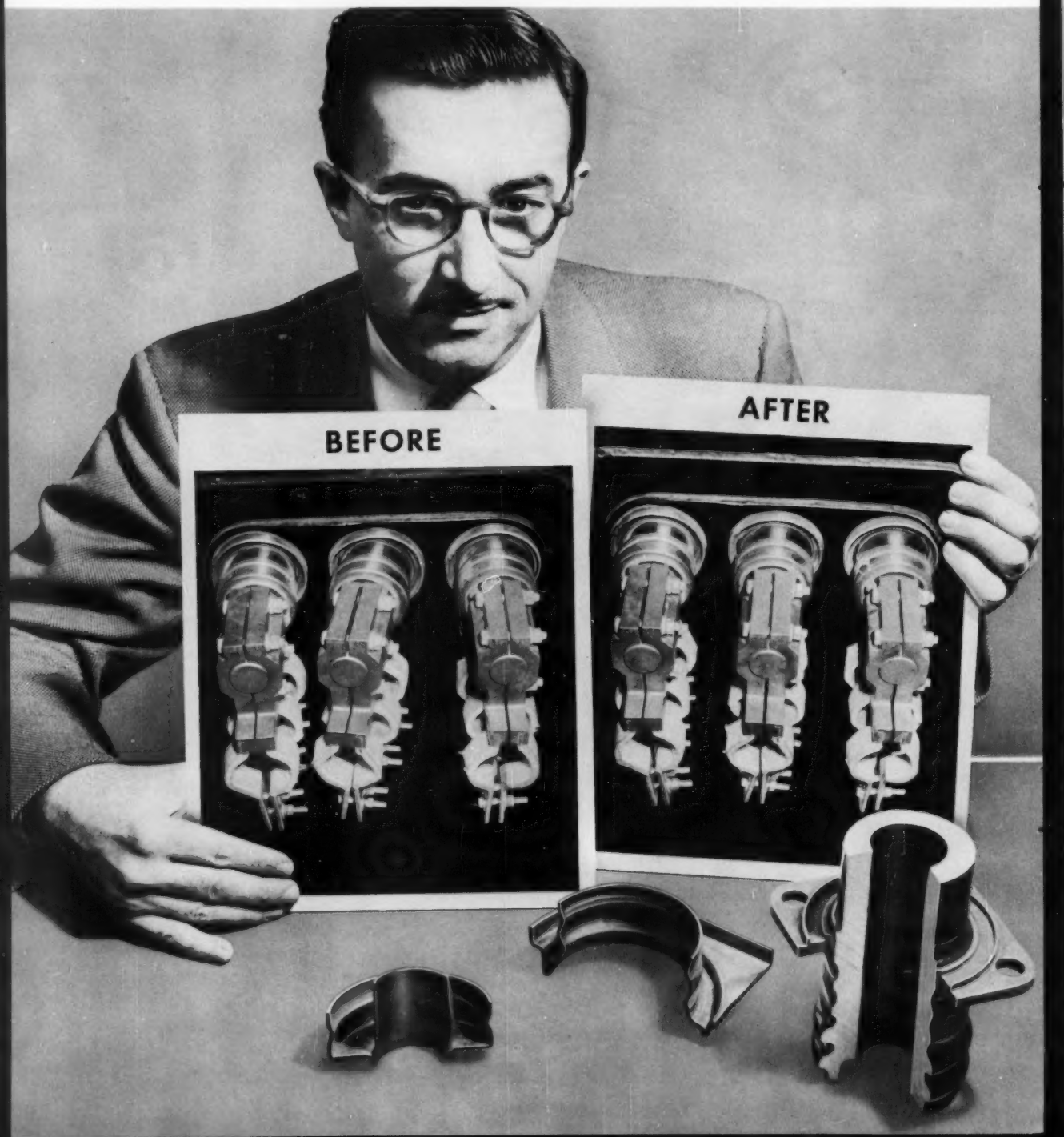
Changing times—changing patterns of working and living—create continuous problems in the operation of networks. Every day, utility executives and engineers come to grips with such diverse problems as maintenance, expansion needs, a broad variety of load densities, zoning and rights of way.

By virtue of experience dating back to the first installations, plus a complete line of network apparatus, and engineering service, Westinghouse is prepared to help you solve network system problems. On the next 7 pages, R. F. Lawrence, Westinghouse Distribution Engineer, cites typical examples.

Westinghouse

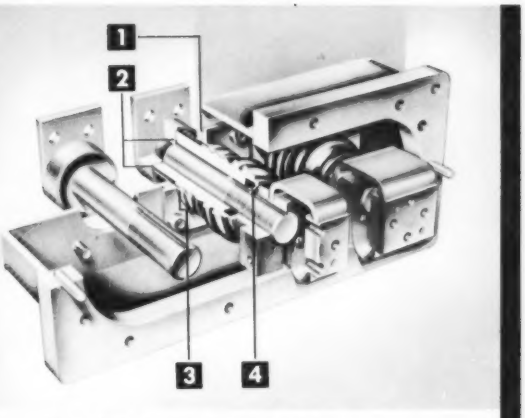
"Bushing leakage on network transformers has been a long-standing industry problem. V. H. Hahn, Network Transformer Sales, explains how Westinghouse solved it."

V. H. Hahn points out the displacement of a new RFW bushing that was damaged in shipment. Even after the studs were forced back into position, they remained leakproof . . . no permanent damage.



problem: **Getting leakproof bushings for network transformers**

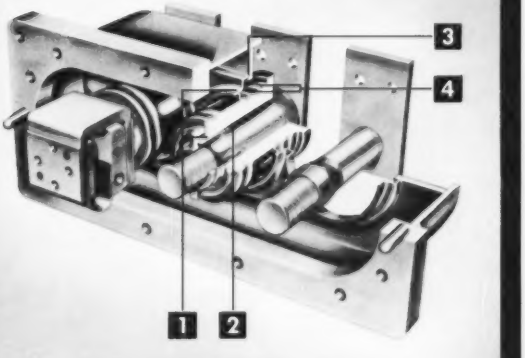
solution: **New double-seal rolled-flange bushings**



Type RFG low-voltage bushings for network transformers

1. Tank-to-bushing seal: retained Cortite gasket
2. Stud-to-bushing seal: retained Cortite gasket
3. Rolled seal: silicone (Silastic*) rubber
4. Stud and porcelain interlocking washer

*® *Dow Corning Corp.*



Type RFW low-voltage bushings for network transformers

1. Copper-to-copper inert arc welds
2. Sealing sleeve permanently brazed to stud
3. Copper bushing plate brazed to tank wall
4. Silicone-rubber rolled seal

A radical new bushing design . . . 1200 already in service, without a single instance of leakage! That's the record to date.

The leakproof qualities of the new design were dramatically, if unintentionally demonstrated when a 1000-kva 3-phase network transformer was damaged in shipment to Consolidated Edison of New York. The photographs, on the opposite page, show the severe displacement of the low-voltage bushings. Jacks were used to force them back into correct alignment. Although they had undergone severe shock of impact and the strain of straightening, the bushings remained leakproof . . . when straightened, were as good as new.

The new Westinghouse Type RFW (rolled-flange, welded) low-voltage bushing has the metal sleeve of the flange double-rolled into the contour of the porcelain over silicone-rubber rings. This assures resilience, yet creates a permanent bond. The conductor is sealed to the insulator at the outer end, and the bushing into the tank, by inert arc welding. The result is a hermetic seal without gaskets.

For applications where bolted bushings are preferable, Type RFG (rolled-flange, gasketed) can be furnished. Here the stud is sealed to the insulator, and the mounting flange to the tank, by Cortite* gaskets. A recess in the flange makes uniform gasket compression positive.

Either style assures a complete oil seal that is rugged, resistant to mechanical and electrical shock—one more safeguard to the high quality of performance designed into Westinghouse network transformers.

*Trade-Mark

YOU CAN BE SURE...IF IT'S

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"Built-in flexibility—such as Westinghouse network protectors and unit substations—helps relieve the system strains caused by load growth."

E. Stohr, Design Engineer, shows a newly developed plate with ammeter jacks that can be used on all CM-22 and CM-44 network protectors. This simplifies periodic checking of changing load density patterns.

problem: Handling commercial area load growth

solution: Protectors that keep pace with the need

The Westinghouse line of automatic network protectors is well fitted to the dual role of meeting change-over or expansion requirements . . . without penalizing quality or reliability of service.

The CM-22 heavy-duty protector . . . in submersible or ventilated dry-vault types . . . is designed for service in heavily loaded areas. The CM-44 . . . in submersible, dry-vault or weatherproof, pole-mounted types . . . is for locations of medium load. And for light-density areas, the CM-88 is ideal.

In addition to meeting any variant of service, Westinghouse protectors help you save on investment as system changes are made. The CM-22 readily replaces the CM-44 when loads increase, without upsetting system coordination—the relays are identical. The replaced protector can be moved to lighter loads.

Extending low-cost network protection in new or growing outlying areas is a simple matter . . . the outdoor, weatherproof CM-88 mounts on poles like a transformer.

Controlling all Westinghouse protectors is the high-torque CN-33, 3-phase induction master relay . . . sturdy, compact and dependable, long wearing.

problem: **Fitting the power supply to the load**

solution: **Long-term flexibility in unit substations**

Three *standout* advantages protect your investment in Westinghouse unit substations.

First, coordination in design and manufacture. Equipment components are engineered and factory-assembled to work together in a convenient, dependable arrangement. Design, engineering and manufacturing are the sole responsibility of one experienced organization.

Second, a Westinghouse unit sub provides the physical and electrical flexibility that marks it a system investment with a future. The unit sub not only helps you bring distribution close to load . . . a saving in itself . . . but helps you accommodate changes in load density on short notice. Transformers can be changed—and quickly. When load grows or shifts, an entire substation may be moved with minimum service interruption, with 100% equipment salvage.

Third, unit subs are compact and attractive in appearance, which means minimum real estate investment, less likelihood of community restrictions. Location of stations for efficiency, expediency and acceptance is an easier problem with Westinghouse equipment.

Westinghouse unit substations are a practical, economical, long-term investment. The facts speak for themselves.

YOU CAN BE SURE...IF IT'S

Westinghouse

This unit substation is a good neighbor, points out G. Metzler, Manager, Unit Equipment Sales. Not only neat and attractive, this Westinghouse unit uses a minimum of space, and features the completely safe dead-front construction.

"Here's the quickest and most economical solution to the headaches brought on by overloading of networks: specially designed Westinghouse network capacitors and equipment."

problem: **Overloaded network transformers**

solution: **Network capacitor . . . inexpensive, submersible, easily installed**

There is no faster, less expensive way of raising network capability, when you're faced with both overload and decreased power factor, than with Westinghouse network capacitors.

At far less cost, network capability can be improved with the new Westinghouse 13½-kvar, 216-volt secondary capacitor than with installation of larger transformers or network protectors. Studies have shown, for example, that application of an 80-kvar capacitor bank with a 500-kva transformer may produce a usable load-capacity gain of up to 11% at 85% power factor. An installed cost of $46.00 for the capacitors results in a gain of one kva of network capacity.

Specially designed for underground use, the Westinghouse capacitor will operate in 55°C ambient temperature. The steel case is protected against corrosion by a heavy coat of zinc, covered by an organic paint finish. Even when subjected to salt water immersion these units last many years, and in dry vaults, 25 years—maintenance-free. The capacitor is equipped with a newly developed current limiting fuse to remove any short-circuited unit from the line before the case can rupture, even under high fault current.

Because of its compact design, the Westinghouse network capacitor requires little space . . . this may be a decisive factor when considering existing vault area. Capacitors may be ordered singly, or as factory-assembled and wired racks in multiples of three (40, 80 or 120 kvar). These racks can be mounted on floor, wall or ceiling.

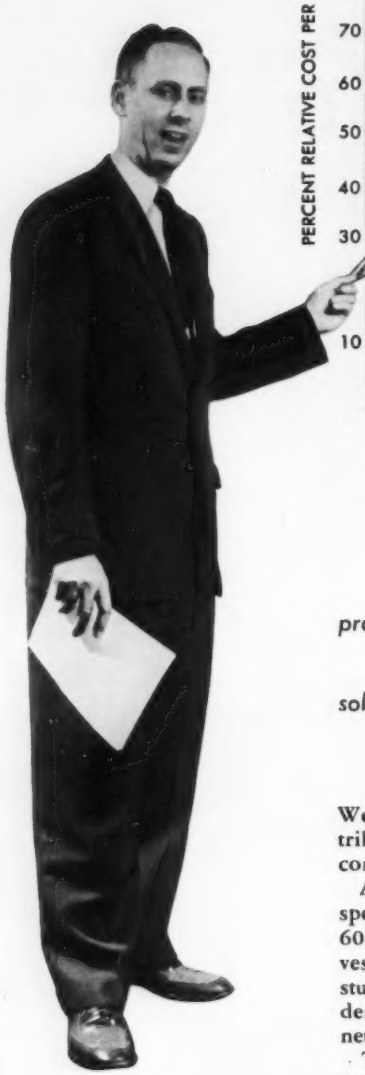
Basic electrical reliability is paramount in the design of network capacitors. Specify Westinghouse for an easier and more economical way to buy, apply and install them.

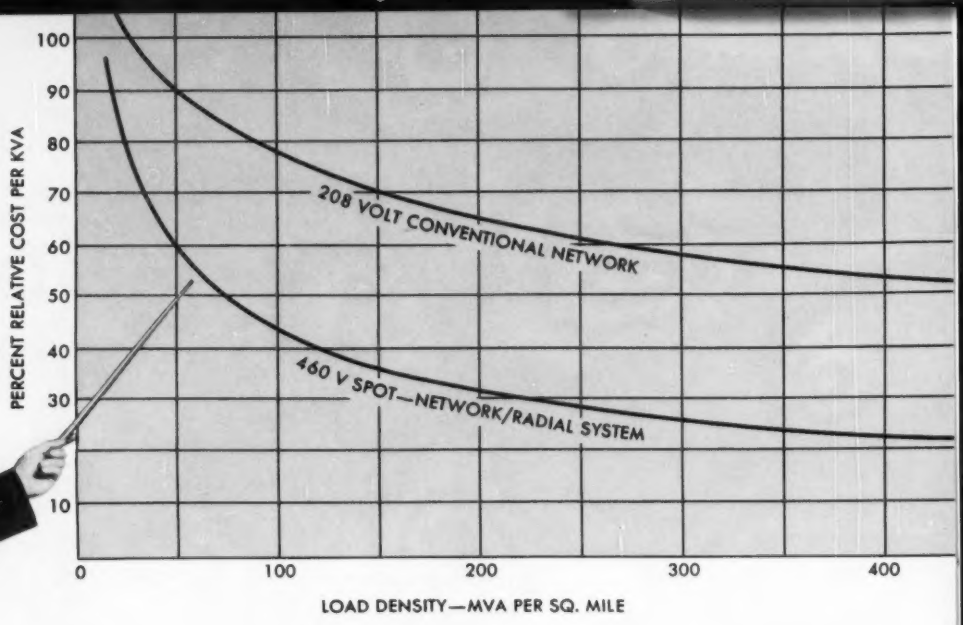
H. Brooks, Supervisory Capacitor Engineer, points out how the special neoprene sleeve waterproofs and insulates both fuse and terminal connections of Westinghouse network capacitors.

This Westinghouse network capacitor equipment, furnished factory-assembled and completely wired, is rated 120 kvar to serve the Westinghouse 500-kva network transformer. Note accessibility, and minimum space required. This installation was made by Alabama Power Company, in downtown Mobile.

YOU CAN BE SURE...IF IT'S

Westinghouse





This chart helps explain the interest in higher distribution voltages for commercial areas and buildings. It demonstrates the savings of a higher secondary voltage spot network radial system over a conventional 120/208-volt network.

problem: **Concentrated load areas**

solution: **265/460-volt spot network systems**

Westinghouse studies proved it—utility acceptance confirmed it—higher distribution voltages are the most practical and economical solution for heavily concentrated loads in large commercial buildings and commercial areas.

A joint study with a large eastern utility showed that a nominal 265/460-volt spot network radial system of a-c secondary network for high load densities—60,000 kva per square mile and up—offered savings up to 25% in original investment over a conventional 120/208-volt network. Another Westinghouse study of a similar system applied to a small city with a projected average load density of 120,000 kva per square mile offered similar savings over a conventional network.

This new concept of commercial area distribution is based on one or more 265/460-volt multi-transformer spot networks which not only serve large spot loads, but also supply, via multiple radial circuits, nearby loads. These radial secondaries also supply 3-phase autotransformers which step down to a nominal voltage of 120/208 volts and are connected into a secondary grid.

In addition to lower original cost, such systems offer important advantages to both utilities and power users. Higher voltages mean lower losses and thus more revenue for utilities. Users benefit from economies of direct feeding of large motors for air conditioning and modern fluorescent lighting.

Call The Man With The Facts for solutions to your network problems—or for more facts on the apparatus presented in the preceding pages. He's your nearby Westinghouse Sales Engineer—backed by 33 years of Westinghouse leadership and experience in a-c secondary networks. Or, if you prefer, write direct to Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE **SURE**... IF IT'S

Westinghouse

CP-1034

El Paso Selling Salesmen

El Paso Electric Co's dealer relations department boosts volume-building results of free home trials by asking salesmen to try a dishwasher in their homes for a week. The utility points out it has sold more dishwashers in four months of free trials than it sold during all of 1955. Before selling housewives, it tells salesmen, you have to sell yourself.

Scorecard on Cooling

Recent Worthington Corp survey finds that homeowners using air conditioning report better family appetites (63%), serve more hot meals during summer (75%), notice improved family dispositions (58%), have more—and more enjoyable—recreation time (43%), report generally improved family health (65%), say fewer colds are suffered (40%), gain relief from allergies, asthma, sinus (48%), and say they now spend vacations at home (48%).

Can You Use "Skimpy Wiring?"

"Skimpy Wiring," figure used by Kennecott Copper Corp to belabor bad wiring bugaboos, can be used without restriction by anyone in electrical industry, company says. For copy prints, write C. T. Jaeger, Kennecott Copper Corp, 161 E 42nd St, New York 17, N. Y.

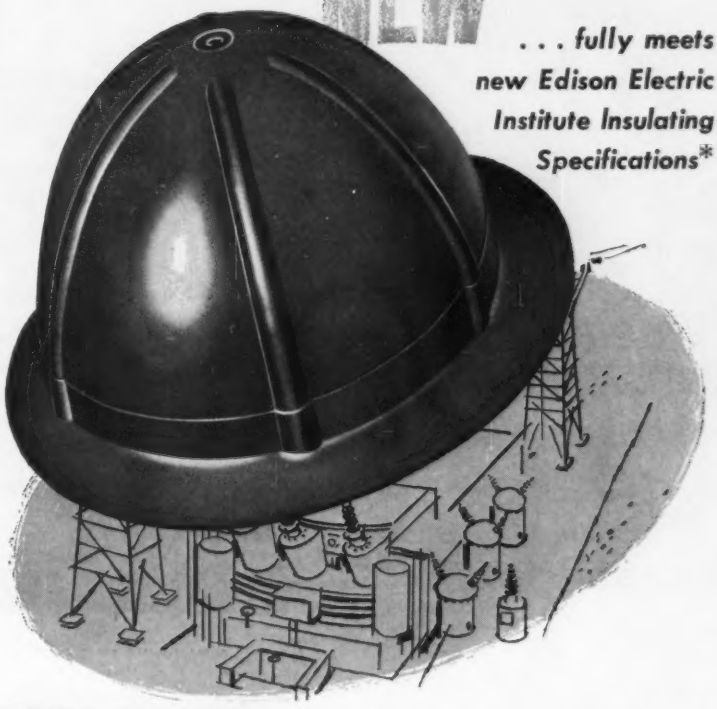
Competitor's Corner

Gas utility industry counted 1,439,000 new gas house heating jobs in 1955-56 heating season, an American Gas Association report claims. The industry expects to add 3.8 million new jobs during next three heating seasons for a total of 19.2 million gas-heated homes by December 1958. At end of 1955, 15.4 million homes were heated by gas, 57.5% of all residential gas customers.

Is acceptance of gas clothes dryers gaining? Unit volume of gas dryers increased 65% in January-February over the same period in 1955, says American Home Laundry Manufacturers' Association. This compares with a 33% gain for electric dryers. February gas unit sales totaled 42,507, electric 106,015.

NEW

*. . . fully meets new Edison Electric Institute Insulating Specifications**



WILLSON Electrical Worker's Insulating Safety Headgear

* Newest development in Insulating Safety Hats for power line and other electrical workers

. . . One-piece molded plastic hat shell—yellow or white
. . . No rivets—no holes
. . . No metal parts in hat or suspension
. . . All nylon and plastic suspension
. . . Plastic lugs molded in hat shell hold headgear
. . . Meets new Edison Electric Institute Insulating specifications

Send coupon for complete information

Please send me complete information on the new Willson Super-Tough INSULATING *Safety Hat.*

*NAME*_____ *TITLE*_____

*COMPANY*_____

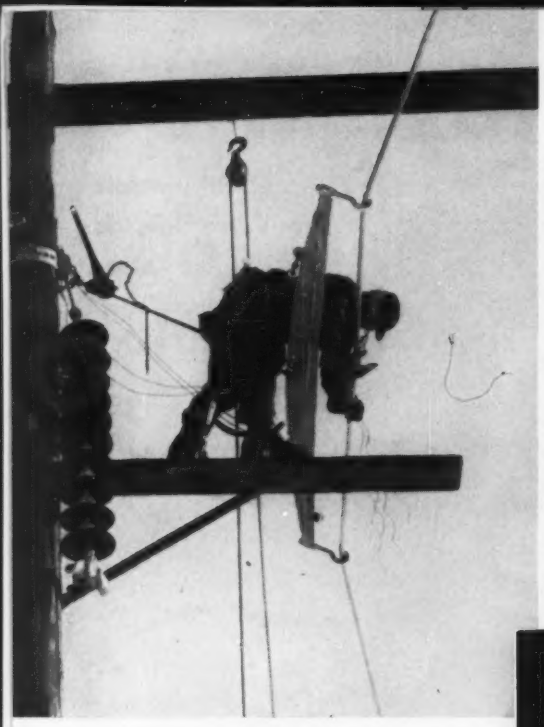
*ADDRESS*_____

*CITY*_____ *ZONE*_____ *STATE*_____

Over 300 safety products carry this world-famous trademark

WILLSON PRODUCTS DIVISION RAY-O-VAC COMPANY

255 Washington Street, Reading, Pennsylvania



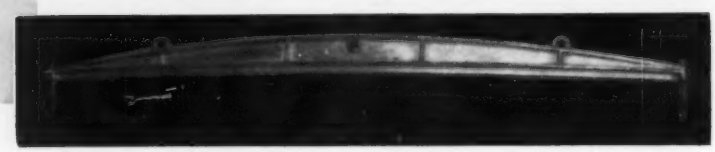
Wire Spreaders

This aluminum alloy wire spreader is an aid in the installation of insulators. The spreader is used to hold transmission cables in position while armor rods are wrapped on the cable and the supporting insulator is attached.

The spreader has two hooks of high tensile manganese-bronze. The hooks are rated 110,000 psi and will handle cable up to 1½-in. diam. They come in various lengths—the greater their length, the more arm room the lineman has to wind the rods.

The spreaders are available in three sizes: No. 1—72 in. long, weighs 35 lb, has 1,000-lb capacity; No. 2—80 in., 40 lb, and 1,500-lb capacity; No. 3—108 in., 71 lb, with capacity of 3,000 lb.

J. F. Hodgkins Co, Gardiner, Me.

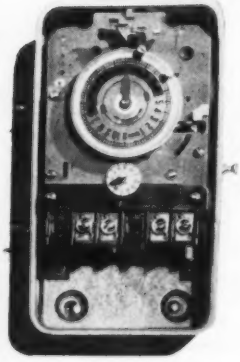


General-Purpose Time Switch

Electric circuits can be turned on or off at any time of day by this general-purpose time switch. The new heavy-duty TSA-40, suitable for indoor and outdoor use, can be used to control all types of street, sign, store and flood lighting, capacitor switches, heating, air-conditioning and refrigeration equipment, irrigation and pump devices, and other types of apparatus.

The 4¾-lb timer measures 9.6 x 6.2 x 4.3 in. Operating voltage is 120, 240 and 480 v ac. Frequency is 60, 50 and 25 cps.

General Electric Co, Schenectady 5, N. Y.



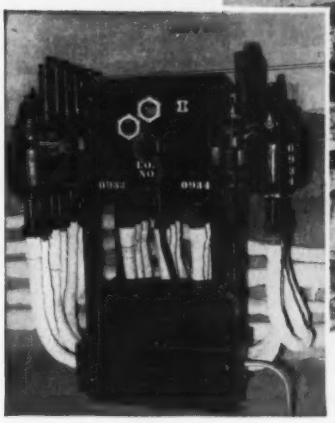
Rod Grapple

The recently redesigned rod grapple is useful where long lines of conduit are to be rodded.

Each pair of rod grapples, weighing 2 lb, permits rodding from both ends of the conduit. Manufacturer reports that the four hooks on the one tool and the two loops on the other engage with positive action, providing a sure connection where they meet.

T. J. Cope, Inc, Collegeville, Pa.

(*More New Equipment on page* 174)



Switch vault at fabulous Fontainebleau Hotel where durable neoprene-jacketed PILC cables with asbestos fireproofing enter from FP&L conduits. Two sets of 15 kv cables are shown (left). Over 40 miles of neoprene-jacketed cable service Miami Beach.

Florida Power & Light Company reports:

Neoprene jackets solve corrosion problem of lead-sheathed cable at Miami Beach

CORROSIVE ACID GROUND WATER, formed by decaying underground swamps, was the problem faced by FP&L engineers at Miami Beach. A water table only four feet below street level was a further complication. Clearly a rugged, acid-resistant cable was needed for power distribution—and neoprene supplied the answer.

Extensive tests showed that neoprene jackets give lead-sheathed cable long-term protection against corrosion and galvanic attack. And neoprene's resilience and resistance to abrasion convinced FP&L they'd get long service despite vibration and cable movement. Today, *over 40 miles* of lead-sheathed cable jacketed with neoprene carry primary power to Miami Beach!

WHEREVER IT'S INSTALLED—above ground, in ducts or conduits, or buried direct in earth—neoprene-jacketed wire and cable give long, dependable service. Your supplier will give you more information. Neoprene-jacketed cable is available in single- and multiple-conductor types and in voltage ratings to meet your requirements.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Read how neoprene's resistance to *all* sources of deterioration cuts maintenance costs on products old and new. Actual on-the-job reports are featured in every issue. Clip coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.),
Elastomers Division EW-5, Wilmington, Del.

Please put my name on the mailing list for the Neoprene Booklet.

*Name*_____ *Position*_____

*Firm*_____

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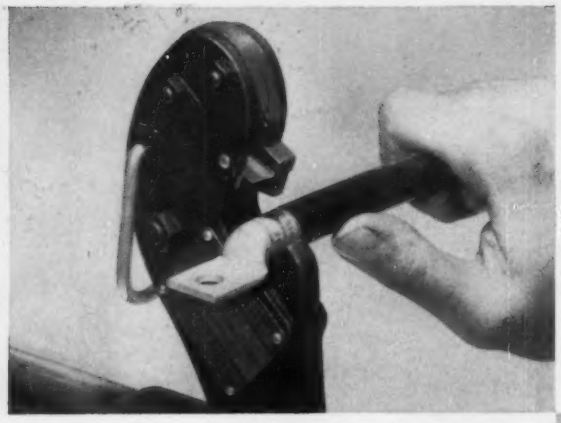


Color-Keyed Connectors

A line of compression connectors for copper conductors is color keyed to match the installing dies. Each connector size from No. 8 AWG to 250 Mcm is color keyed to correspond to a die in the hand tool.

The installer matches the color on the connector and die. This is said to speed installation and reduce possibility of error. The color-keyed connectors also simplify and speed inspection.

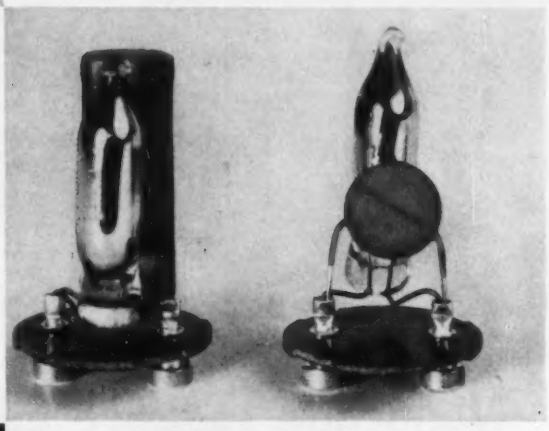
Thomas & Betts Co, Elizabeth, N. J.

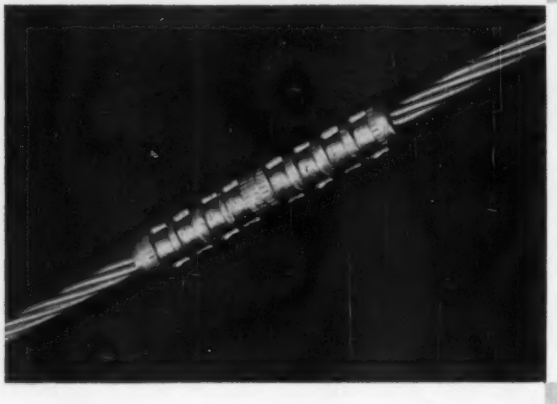
Fluorescent Lamp Starter

A ceramic condenser has been incorporated into a fluorescent lamp starter. The new condenser is said to stand up under extreme weather conditions and to be "self-healing" on breakdown by h-v surges.

Illustration shows the inside of an ordinary starter at left and the new type at right. The glass element behind the condenser is the globottle, the only limitation on the life of the new starter.

Sylvania Electric Products, Inc, New York 19, N. Y.





Hysplice for AAAC

Full-tension, one-piece Hysplices are designed for all sizes of all-aluminum alloy conductor (AAAC).

The Hysplices are constructed of heavy-wall aluminum tubing. All splices have knurled guide marks for exact crimping and index numbers for rapid tooling identification. They are factory capped and are filled with Penetrox, the company's oxide preventative and corrosion inhibitor compound.

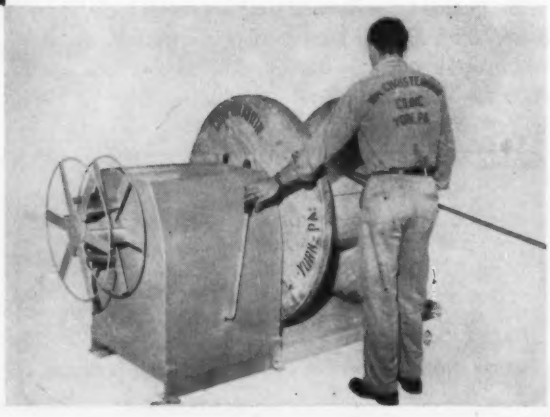
Burndy Engineering Co, Inc, Norwalk, Conn.

Rewinding Machine

One man can handle the rewinding of electrical cable, wire rope, or other lineal material with this rewinding machine known as the Vari-Speed Rewinder.

The machine is about 40 in. high and 84 in. wide. Its drive arm has an adjustable pin to fit any reel, and a hydraulic mechanism raises and lowers the reel. Power is supplied by an electric motor which can be plugged into any 110-v outlet.

Wm. Christensen Co, Inc, York, Pa.



(*More New Equipment on page* 176)

DRIVE DEEP!

Seasonal variance in water table levels for a given locality is a factor of prime importance in efficient grounding. This fluctuation has a definite relationship to permanent moisture levels which must be reached and maintained for grounding rods to be effective. Deep grounding procedure coupled with regular testing provides a sound basis for maintaining maximum protection for equipment and personnel, as well as continuity of service.

That's because deep grounding assures you of a good connection with permanently moist, low resistance soil. Lets you work to a standard of low resistance that gives maximum dependability to the performance of your protective equipment.

Hubbard Copperweld sectional ground rods are made especially for deep grounding. They are designed so that additional sections may be added as needed to reach the depth of permanent moisture and the proper standards of resistance. And they're Molten-Welded, an exclusive process that makes Copper and Steel perform as a single solid unit, yet gives the high conductivity and corrosion resistance of Copper and the strength of Steel.

Your Hubbard distributor carries complete stocks of Copperweld sectional ground rods. Contact him. Meanwhile, if you haven't already received a copy, write for Practical Grounding, an informative handbook of grounding principles and practices, and complete details on how it works.

HUBBARD AND COMPANY

6301 Butler Street
Pittsburgh 1, Pa.

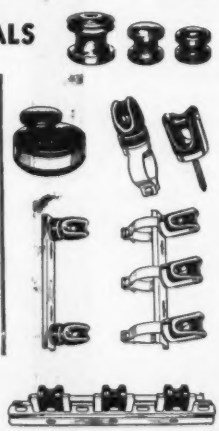
Smooth "Pulley Action" Wireway Prevents Conductor Chafing
Extra-Sturdy Copper Rivet
Large 1" x 7/8" Hole
Heavy Steel Cup-Base and Yoke—A Single Steel Stamping
Two Holes in Base Assure Effective Drainage
No. 22 x 2-1/4" Screw Assembled Solidly and Rigidly to Metal Base
Extra Sharp Threads and Quick-Starting Point Make Driving Easy

RUGGED DURABLE DEPENDABLE

PORCELAIN PRODUCTS

WIREHOLDERS

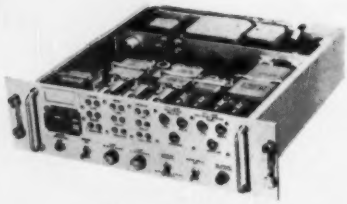
AND SECONDARY SERVICE MATERIALS



Where *quality* and *performance* are necessary for continuous line service—Porcelain Products wireholders and secondary service materials *assure* reliability. They're engineered with strong, sturdy construction—metal in tension, porcelain in compression. Steel parts are hot-dip galvanized . . . screw threads are extra sharp, lubricated for ease of installation. Larger, pulley-action wire hole, for large wire sizes—prevents chafing, wire wear.

These EXTRA features—*plus*—Porcelain Products "Quality Line" reputation, make an unbeatable combination . . . SPECIFY PORCELAIN PRODUCTS wireholders and secondary service materials.

61 Years **Porcelain Products, Inc.** PP INC.
FINDLAY, OHIO

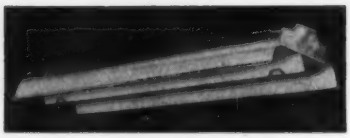


Audio-Frequency Terminal

An audio-frequency shift terminal is designed for use in the transmission and frequency multiplexing of telegraph, telemetering, and supervisory control signals. The Model 812 may be used with one teleprinter for sending and receiving with automatic break-in facilities, or with two printers for simultaneous transmission and reception.

A 5¼ x 19 x 16-in. chassis contains transmitter and receiver sections for one channel which includes the equipment and loop power supplies. The equipment contains no relays and will operate at both slow and high speeds. A test jack field is provided on the front panel.

Radio Frequency Laboratories, Inc, Boonton, N. J.



Industrial Fixtures

Two heavy-duty industrial fluorescent fixtures are designed to meet 1956 RLM specifications. They are:

- Imperial, IN-200 Series (illustrated). It provides about 25% upward light, 30-deg shielding crosswise, and is designed to meet RLM specification SD-1 for semi-direct lighting. The fixture is available in 2-lamp 48 and 96-in. sections for Rapid-Start, Slimline and 800-ma Rapid-Start lamps.
- Crown, IN-100 Series. This fixture provides about 10% upward light and is designed to meet requirements of RLM specifications D-1, D-2 and D-3 for direct lighting. It is available in 2 and 3-lamp 48 and 96-in. Rapid-Start and Slimline, 2-lamp 48 and 96-in. 800-ma Rapid-Start, and 2-lamp 60-in. T-17 General Line.

Miller Co, Dept IN-1, Meriden, Conn.

(More New Equipment on page 178)

G-E LAMPS GIVE YOU MORE FOR ALL YOUR LIGHTING DOLLARS

Fulfill your street lighting contracts profitably with General Electric Mercury Lamps

A FULL line of General Electric mercury lamps for street lighting now enables you to fulfill your lighting contracts more profitably. In residential areas, business districts or on expressways, when you install General Electric mercury lamps you can count on economical, trouble-free lamp life averaging 18 months or more. And you get the high efficiency you expect from mercury lamps.

Mercury street lighting has always been economical and dependable. Recent developments in General Electric mercury lamps make it even more so today. The G-E H400-E1, for instance, now has an economic life rating of 6000 hours. It has an initial light output of 21,000 lumens, *factual rating*, which means you amply fulfill your lighting contracts. And the uniformity of G-E mercury lamps is better than ever, so that costly trouble-shooting calls to replace lamps out of schedule are held to a minimum.

All General Electric mercury lamps are available also with color-improving phosphors. These color-improved lamps restore a warmer, more natural appearance to complexions and store window displays.

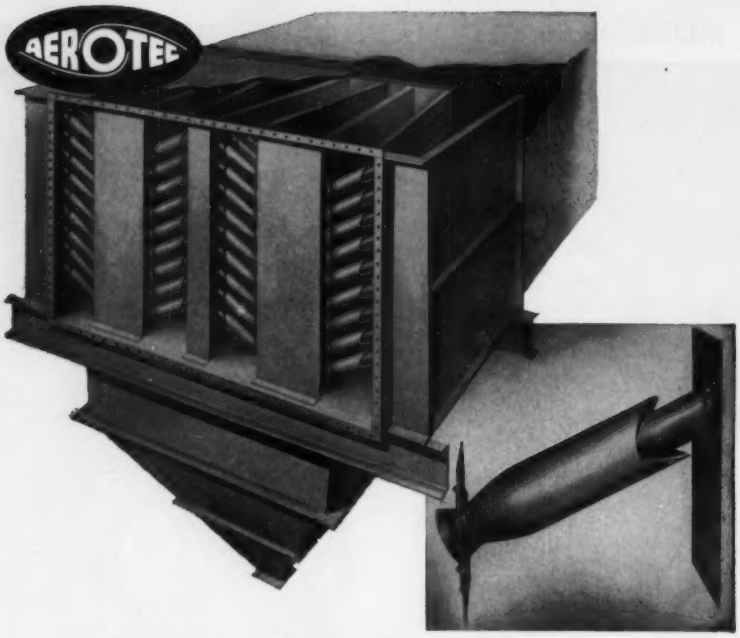
FULL LINE OF G-E MERCURY LAMPS

For residential areas, where lower light levels are permissible, there is a reliable 100-watt General Electric mercury lamp. It uses the same suburban-type luminaires widely used with filament lamps, but it increases their lighting effectiveness up to 200%. Whatever your street lighting needs, there's a General Electric mercury lamp for the job—in a full range of wattages from 100 to 1000, color-improved and standard, to give you big economies and dependable light.

For more information on how you can use General Electric mercury lighting tools to cut your street lighting costs, write Large Lamp Department, Dept. EW-5, Nela Park, Cleveland 12, Ohio.

Progress Is Our Most Important Product

GENERAL ELECTRIC



longer life for

MECHANICAL DUST COLLECTORS

New Aerotec Tube Offers

- **Higher Efficiency**
- **Erosion Resistance**
- **Simplified Field Erection**
- **Low Maintenance**

The new Aerotec 5" Tube of white cast iron assures extremely high dust collector efficiency and in service far exceeds tubes of other basic metals. Accelerated tests conducted by Aerotec engineers have proven conclusively that white iron is superior in reducing wear, even when caused by the most highly abrasive particles.

Tubes are factory assembled into "building block" elements to simplify field erection. In addition, the inherent design of the 5" Tube reduces the possibility of plugging, even at low temperatures, or when the fuel has a high sulphur content. Years of research behind the development of this tube now assure a collector that requires minimum maintenance.

For information about the new Aerotec Tube, call or write to The Thermix Corporation, Project Engineers for Aerotec.

Project Engineers **THE THERMIX CORPORATION** Greenwich, Conn.
(Offices in 38 principal cities)
Canadian Affiliation: T. C. CHOWN, LTD., 1440 S. Catherine St. W., Montreal, Que.

Manufacturers
THE AEROTEC CORPORATION
Greenwich, Conn.

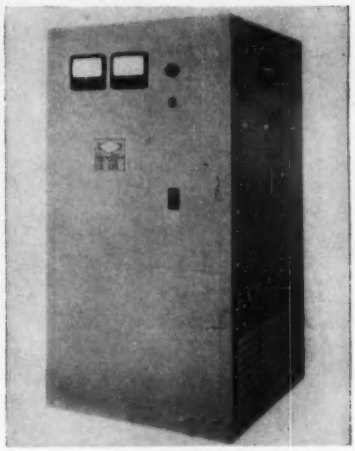
Derrick Conversion Kit

A field kit makes it possible to convert a rigid tripod derrick into a hydraulically operated, live-boom unit. The kit is designated 5700-C.

To convert a derrick, its side legs are cut and hinged, and the center leg is cut for installation of the double-acting cylinder which provides live-boom action. The kit includes all hydraulic components and piping. The hydraulic control valve is located on the rear of the truck body panel.

Locking of the side legs for derrick operation can be done by pin-type or hydraulic sleeve locks. A relief valve in the hydraulic system provides built-in safety.

J. H. Holan Corp, 4100 W. 150 St, Cleveland 11, Ohio.



Automatic Charger

This 60-amp unit has been added to a line of automatic battery chargers. The new model is designed for maintaining utility batteries at unattended substations at full charge.

Manufacturer claims the unit is completely automatic, requires no adjustment or maintenance. It is said to extend battery life and reduce maintenance because gassing and water loss are eliminated.

Rectifier power circuit is fullwave. The automatic regulation circuit is a high gain magnetic amplifier that provides output voltage regulation to within $\pm 1\%$.

Walker Division, Norma-Hoffman Bearings Corp, Stamford, Conn.

(*More New Products on page* 180)

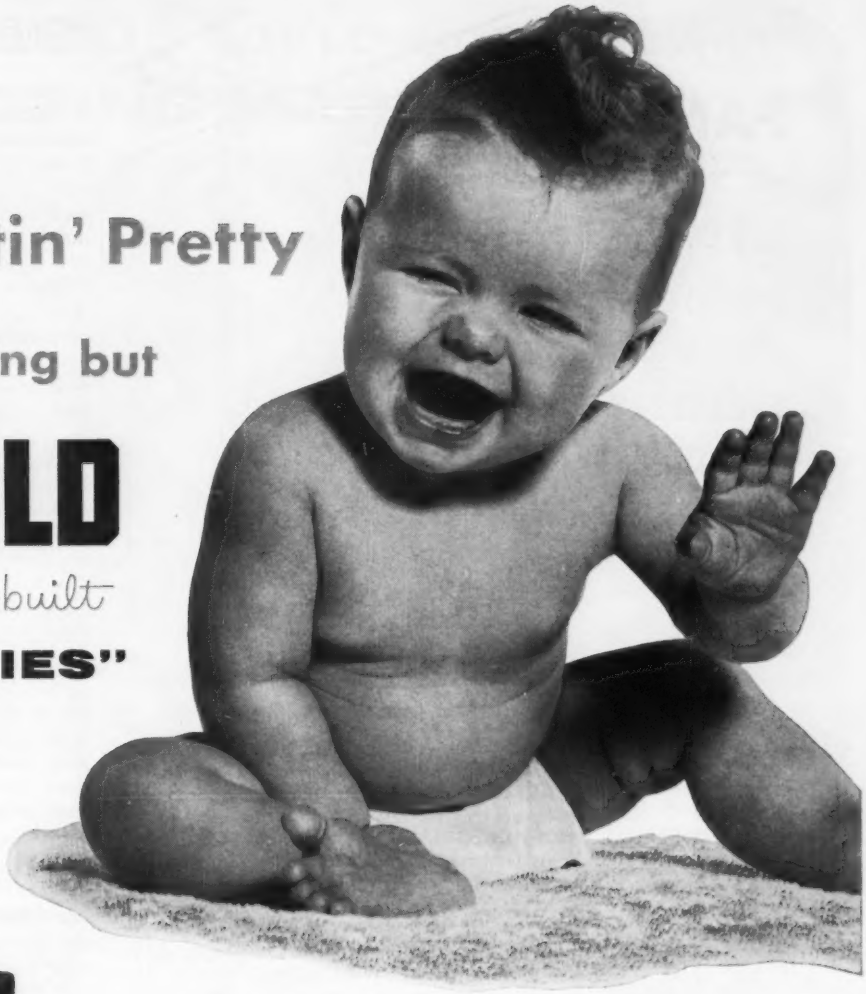
"I'm Sittin' Pretty

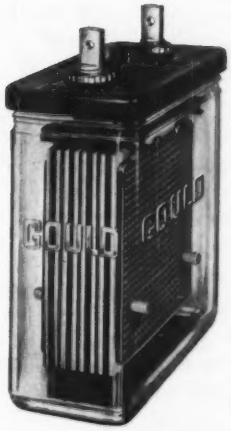
use nothing but

GOULD

Research-built

BATTERIES"





America's Finest!
GOULD PLANTÉ
The Aristocrat of
Stationary Batteries

There are three big reasons why it pays to choose Gould Research-Built Batteries:

1. They are the finest batteries modern science can give you—research-built for longest service life.
2. Strategically located Gould plants assure prompt attention to your battery requirements.
3. Gould Field Engineering Service, finest in the industry, nation-wide in scope, is as close to you as your telephone, always ready to see that your batteries are properly cared for and maintained . . . that you get maximum battery performance.

The MATERIAL HANDLING INSTITUTE'S EXPOSITION
Cleveland, Ohio
PUBLIC AUDITORIUM
1956
EXHIBITOR
Booth 1425

Always Use Gould-National Automobile and Truck Batteries

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BATTERIES
GOULD-NATIONAL BATTERIES, INC.
Trenton 7, N. J.

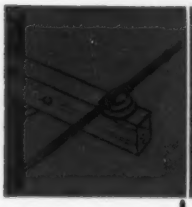
"BETTER BATTERIES THROUGH RESEARCH"

©1956 Gould-National Batteries, Inc.

FANNER
Superformed
LINEGUARDS
provide lowest cost protection on SHORTSPAN CONDUCTORS

Fanner Superformed LINEGUARDS give short span distribution lines complete protection against abrasion, arcover, or clamp or tie wire damage at lowest possible cost. They have the same features of ease of installation, lasting durability and reuseability as Fanner ARMOR RODS, but are smaller in wire size and shorter, therefore cost far less: It's good economy to use Fanner LINEGUARDS on short spans with low tensions (1) at support points to protect against clamp or tie wire damage, (2) to provide a protective layer for tapping purposes, (3) at expulsion-gap or other critical locations. Further information and prices on FANNER Superformed Lineguards will be furnished on request. Write today.

Other FANNER ELECTRICAL LINE PRODUCTS

ARMOR RODS	PATCH RODS	TAP ARMOR	PLASTIC FANNGUARDS
			
• For protection against vibration damage and also good for emergency repairs on partially broken overhead lines.	• Act as a "repair sleeve" for conductors having up to about ¼ of the wires broken in the outer layer.	• Provides a protective layer of shortened rods on conductor for making taps without risking damage to conductor.	• Tough, durable spiral wound plastic sleeves that snap together over covered wires and cables to provide protection against tree abrasion.

Licensed for use under Patent No. 2,275,019

Fine Fanner Superformed

THE FANNER MANUFACTURING CO.
Electrical Products Division
Brookside Park Established 1894 Cleveland 9, Ohio

AGENTS AND DISTRIBUTORS IN PRINCIPAL CITIES

MORE NEW PRODUCTS

National Aluminate Corp, Dept P, W. 66th Place, Chicago 38, Ill., has a **weed control chemical,** Nalco H-174, a dry granular material said to be virtually dustless. It may be used any time of the year at a dosage of 300-400 lb per acre.

Electro Devices, Inc, 4025 Easton Ave, St. Louis 13, Mo., offers a line of portable **h-v test units** rated 0-20 kv. They feature adequate overload protection and pilot light monitoring of switching.

McGill Mfg Co, Inc, Valparaiso, Ind., has a line of **rubber-hook lamp guards** that are now available with a thumb-release clamp cage to permit changing burnt bulbs without tools. The handle is made of hard molded rubber encasing a steel core.

Motorola, Inc, 4501 W. Augusta Blvd, Chicago 51, Ill., has a **radiophone** known as Private Line. The speaker cannot be unlocked by nuisance noise and undesired transmissions from other two-way radio systems on the same channel.

U-C Lite Mfg Co, 1050 W. Hubbard St, Chicago 22, Ill., has five heavy-duty **glass jar batteries** ranging from 25 to 100 amp-hr. A remote-mounting light head is available also.

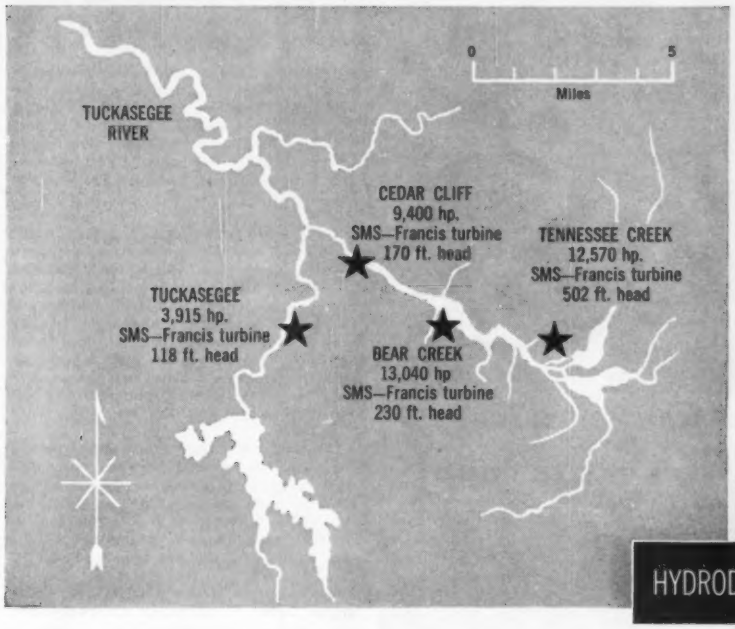
General Electric Co, Schenectady 5, N. Y., has a totally enclosed, **shaded pole motor** with "sealed-in" lubrication system. The 39-frame motor has 5½-in. diam and is available from 1/15 through 1/10 hp.

W. H. Brady Co, 727 W. Glendale Ave, Milwaukee 12, Wis., has a self-sticking aluminum foil metal **wire marker.** It is 3 mils thick and withstands temperatures up to 375F.

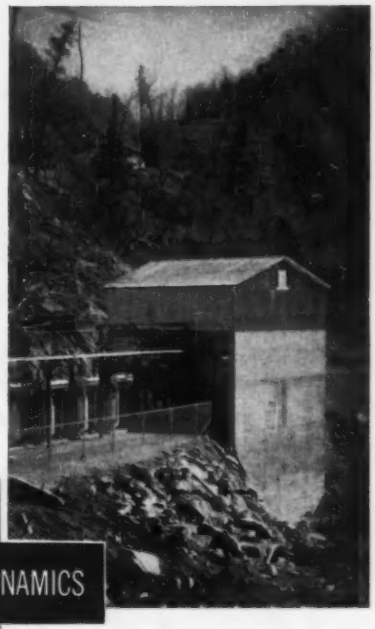
Reliance Electric & Engineering Co, 1088 Ivanhoe Rd, Cleveland 10, Ohio, has a line of gearmotors, ac and dc, 1 through 60 hp, in wide selection of mountings and ratios.

Radex Corp, Chicago, Ill., has added **electrostatic air-cleaning components** to its line of central air-conditioning equipment.

HOW ALCOA GOT LOW-COST POWER
DEVELOPING MARGINAL SITES



Between 1949 and 1952, Alcoa developed extra hydropower at low cost from these small sites on the headwaters of the Little Tennessee River.



Cedar Cliff is typical of the small, unattended stations in this development.

HYDRODYNAMICS

To get additional hydropower at minimum costs, Alcoa and its subsidiary, Nantahala Power & Light Company, have reached into the headwaters of the Little Tennessee River. As shown on the sketch map, four small sites on the east and west forks of the Tuckasegee River and Tennessee Creek now permit far greater utilization of the available water. But to make such installations pay, construction, operating and maintenance expenses were carefully planned and closely controlled.

Each of the new facilities is remotely operated from an existing station. Rock fill dams and unlined tunnels helped keep costs down, while powerhouses were built just large enough for the unit. On the SMS turbines themselves, vulnerable parts were given protective coatings of stainless steel to reduce maintenance over the years.

SMS turbines at these four stations have a total rated output of approximately 39,000 hp. All four of these are SMS-Francis types, while at Queens Creek Station a 2,250 hp. SMS-Impulse turbine operates under a 999-foot maximum gross head. SMS butterfly and relief valves supplied with the Tennessee Creek installation.
Whatever your needs for hydraulic turbines and accessories, contact S. Morgan Smith Company at York, Pennsylvania.

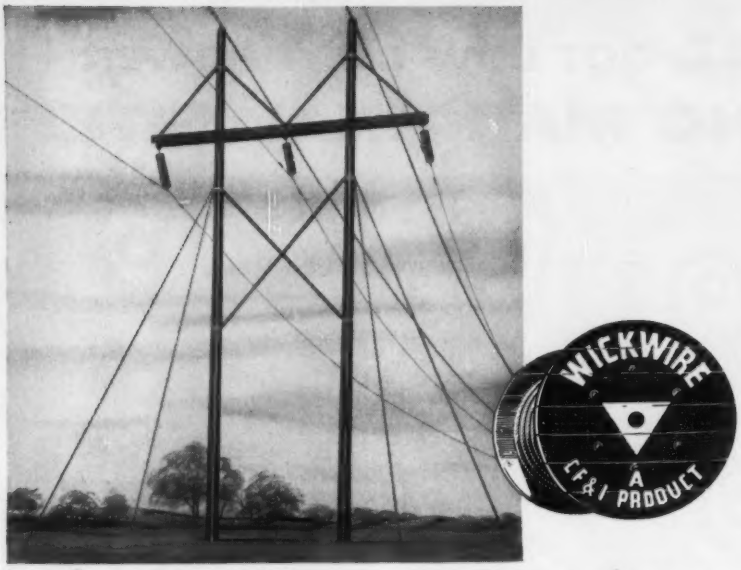
HYDRAULIC TURBINES
GATES & HOISTS
TRASH RAKES
PUMPS
ACCESSORIES

HYDRODYNAMICS

ROTOVALVES
BALL VALVES
BUTTERFLY VALVES
FREE-DISCHARGE VALVES
CONTROLLABLE-PITCH SHIP PROPELLERS

S. MORGAN SMITH

AFFILIATE: S. MORGAN SMITH, CANADA, LIMITED, TORONTO



for guy wire. . .messenger wire. . .
ground wire. . .use strong, dependable

CF&I GALVANIZED STEEL STRAND

There's a CF&I 7-Wire* Galvanized Twisted Steel Strand that's ideally suited for every guy, messenger or overhead ground wire application.

That's because every length and type of strand sold by CF&I is carefully made in CF&I's own mills—carefully quality controlled throughout *every* stage of production from ore to finished product. As a result, you know that you're getting steel that has exactly the right chemical and physical properties to do the best job for you . . . and that this steel is carefully drawn, galvanized and stranded into a product that'll give trouble-free service for years to come.

Next time you need strand—whether it's for guy wire or overhead ground wire—be sure you contact the nearby CF&I Representative. He'll be happy to give you complete details on the type of CF&I Strand that's best for your job.

NEED A GUY OR MESSENGER WIRE? Then use CF&I Strand that's made to meet or exceed ASTM Specification A-122 (latest revision).

NEED AN OVERHEAD GROUND WIRE? Then use CF&I Weldless Strand that's completely free of welds or joints of any kind in either the individual wires or the finished strand. Fully meets or exceeds ASTM Specification A-363 (latest revision).

3739

*Also available in 3-wire constructions.

CF&I

WICKWIRE SPENCER STEEL DIVISION · Atlanta · Boston · Buffalo · Chicago Detroit · New Orleans · New York · Philadelphia

THE COLORADO FUEL AND IRON CORPORATION · Albuquerque · Amarillo Billings · Boise · Butte · Casper · Denver · El Paso · Ft. Worth · Houston Lincoln (Neb.) · Los Angeles · Oakland · Oklahoma City · Phoenix · Portland Pueblo · Salt Lake City · San Francisco · Seattle · Spokane · Wichita

CATALOGS—BULLETINS

● **INDUSTRIAL DISTRIBUTION:** Bulletin GED-3039, 48 pages, deals with features, application, operation and other data on distribution system planning and on system-engineered equipment for industrial power distribution. General Electric Co., Schenectady 5, N. Y.

● **PUMPS:** Line of double suction single-stage centrifugal pumps for general service are described in Catalog A-156, 8-pages. Cross section drawings and construction details for standard sizes up to 10-in. discharge are given. C. H. Wheeler Mfg Co, 19th and Lehigh, Philadelphia 32, Pa.

● **HEAT EXCHANGERS:** Publication B-2 is designed to assist engineers in selection of condenser tube alloys. The 44-page booklet discusses application and installation of condenser and heat exchanger tubes, also plates for tube sheets, heads and baffles. Detailed information, based on actual installations and laboratory tests, is presented. Extensive tables give physical properties and other data. American Brass Co, Waterbury 20, Conn.

● **TURNPIKE LIGHTING:** Bulletin No. GED-3001 deals with lighting of turnpikes and expressways. The 28-page booklet includes application diagrams showing types and spacing of fluorescent, mercury and filament luminaires. General Electric Co, Schenectady 5, N. Y.

● **POLE LINE HARDWARE:** Sixty different items of pole line hardware are illustrated in their position on a pole in a large drawing included in 4-page Bulletin No. P256. Hubbard & Co, 6301 Butler St, Pittsburgh 1, Pa.

● **DISTRIBUTION TRANSFORMERS:** Electrical and mechanical features of a line of redesigned distribution transformers for rural service are described in Bulletin No. 61B6726B, 4 pages. Allis-Chalmers Mfg. Co, 932 S. 70th St, Milwaukee, Wis.

● **CABLE TROUGH:** Line of cable rack and trough is subject of Catalog No. 102, 24 pages. Specifications, dimensions, and diagrams are given. Chalfant Products Co, Inc, 11525 Madison Ave, Cleveland 2, Ohio.

● **FRACTIONAL HP MOTORS:** Photographs, diagrams and performance data for a line of fractional horsepower electric motors are given in a 12-page catalog. Redmond Co, Inc, Owosso, Mich.

● **AIR CLEANER:** The Precipitron electronic air cleaner for commercial and industrial applications is described in Bulletin No. B-1425. Westinghouse Electric Corp, Sturtevant Division, 200 Readville St, Hyde Park, Boston 36, Mass.

● **NICKEL-CLAD COPPER:** Engineering and application information on nickel-clad copper wire are presented in 4-page Bulletin No. T-3. Data on electrical characteristics are included. Alloy Metal Wire Co, Prospect Park, Pa.

● **AUTOMATIC SWITCHES:** Bulletin No. 596 simplifies specification of automatic transfer switches. The 16-page brochure gives data on design and selection of the switches. Automatic Switch Co, 391 Lakeside Ave, Orange, N. J.

Truco SAFETY hydraulic cable reel carrier

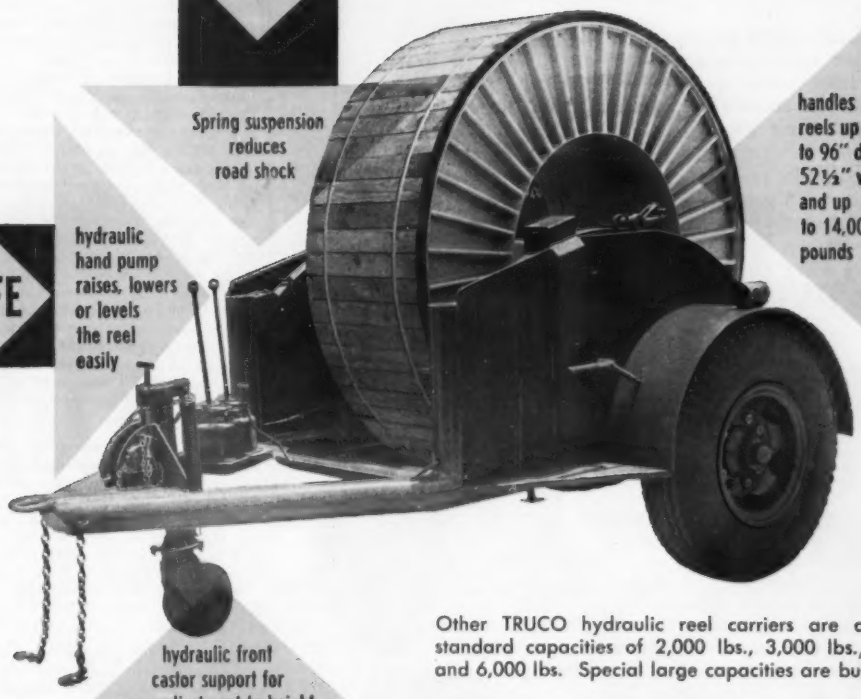
is engineered for safe ONE MAN loading in 6 to 8 Minutes

SAFE

SAFE

SAFE

SAFE



Spring suspension reduces road shock

hydraulic hand pump raises, lowers or levels the reel easily

handles reels up to 96" diam. 52½" wide and up to 14,000 pounds

hydraulic front castor support for easy adjustment to height of pintle hook

Other TRUCO hydraulic reel carriers are available in standard capacities of 2,000 lbs., 3,000 lbs., 4,000 lbs. and 6,000 lbs. Special large capacities are built on order.

Write for detailed brochure, specifications and current prices. Find out how safe and fast cable loading can be.

Truco

TRUCK Equipment COMPANY

3963 Walnut Street • Denver 5, Colorado

Manufacturers of Truco Self-Powered Diggers and Truco Safety Hydraulic Derricks

MR. PRESIDENT:

WHAT DO YOU KNOW ABOUT RT&E?

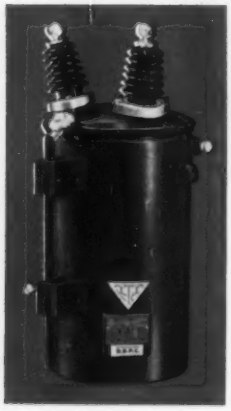
As one of America's leaders in the power industry, we think you should know something about one of America's leading suppliers of equipment to the power industry.

We said "leading" not largest. You should know that RT&E, while not big compared to the giants, is nevertheless big in service, in quality, in progress. We've packed hundreds of man years of experience into our ten years of manufacturing.

We think you'll approve our philosophy that we smaller suppliers are most important to the American economy. Sure, we'll be big some day, but in the meanwhile, we help keep the bigger boys on their toes.

For example, no other transformer manufacturer provides a 5 year guarantee or an externally operated tap changer as standard. We do.

All we want to say here is this: Remember the name RT&E. You'll hear it again.



RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

TECHNICAL LITERATURE

BOILERS — "Boilers and Combustion 1955" is a report of the Boilers and Combustion Subcommittee of EEI's Prime Movers Committee. The report, Publication No. 55-22, gives the results of an investigation covering the operation, service and maintenance of steam generators. Statements from four manufacturers of steam generators are included. Price $0.75 to members. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.

EEI-NEMA STANDARDS—Following are available from Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y., or National Electrical Manufacturers Association, 155 E. 44 St., New York 17, N. Y.:

- "Wet-Process Porcelain Insulators (Apparatus—Cap and Pin Type)" EEI Pub. No. TDJ-58, NEMA Pub. No. 146-1956. This is a report of the Joint Committee of EEI and NEMA on Insulator Standards. It covers material, dimensions and characteristics, marking, packing, manufacturer's production sampling and tests, and design, quality conformance and routine tests. Price $0.30.
- "Wet-Process Porcelain Insulators (Apparatus—Post Type)" EEI Pub. No. TDJ-59, NEMA Pub. No. 147—1956. This is a report of the Joint Committee of EEI and NEMA on Insulator Standards. It covers same aspects as the above standard on cap and pin-type insulators. Price $0.30.
- "Distribution Transformers (Overhead Type)" EEI Pub. No. 55-14, NEMA Pub. No. TR 2—1956. This is the sixth report of the Joint Committee of EEI and NEMA on Standards for Distribution Transformers. It contains design standards for certain mechanical and electrical features of overhead-type single and three-phase distribution transformers rated 500 kva and smaller, high voltage 67 kv and below, low voltage 15 kv and below. Price $1.20.

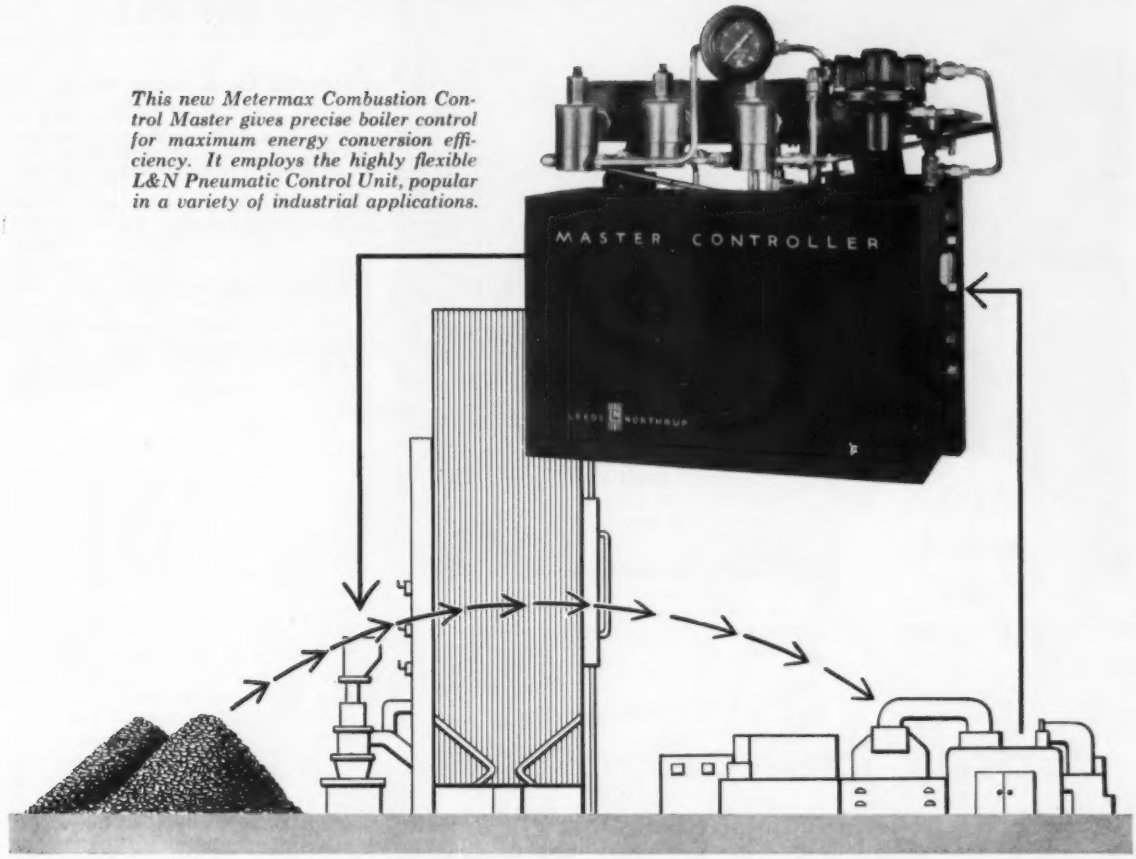
NEMA STANDARDS—Following standards were issued recently by National Electrical Manufacturers Association, 155 E. 44th St., New York 17, N. Y.:

- "Manufactured Electrical Mica" Pub. No. ME 1—1956. Price $1.75.
- "Automatic Temperature Controls" Pub. No. DC 1—1956. Price $1.50.
- "Mining Belt Conveyors" Pub. No. MB 1—1956. Price $1.50.

LIGHTING FUNDAMENTALS—"Fundamentals of Light and Lighting" is title of 104-page Bulletin LD-2. It outlines many fundamentals of physics of light, laboratory and field measurements, light control, light and color, quantity and quality of illumination, and design of lighting systems. Included are charts, diagrams and nomographs for lighting calculations. General Electric Co, Large Lamp Department, Cleveland 12, Ohio.

INDUSTRIAL LIGHTING—"RLM Standard Specifications for Industrial Lighting Units (1956 Edition)" contains revisions in specifications on incandescent and fluorescent industrial lighting units as well as new lighting data. The 35-page book includes new coefficient of utilization tables for 8 different incandescent and fluorescent lighting units. No charge. RLM Standards Institute, 326 W. Madison St, Chicago 6, Ill.

This new Metermax Combustion Control Master gives precise boiler control for maximum energy conversion efficiency. It employs the highly flexible L&N Pneumatic Control Unit, popular in a variety of industrial applications.



Let this "cost-conscious" brain

HELP SOLVE YOUR COMBUSTION CONTROL PROBLEMS

■ The widely-used Metermax Combustion Control now features this new Master Controller which gives you precise, stable boiler control over a wide load range. Because of its unitized design this Master coordinates the three fundamental control actions. Thus, you're assured of a precise blending of: *proportional action* to meet boiler load changes, *reset action* to maintain a constant steam pressure at all loads, and *rate action* to gear response to the speed and intensity of load swings.

You get wide-range stability because the Master automatically "modulates" its own response as boiler load decreases to reduce control action at low loads for maximum stability. Your proportional, reset, and rate settings, once made to meet a given boiler load condition, are correct for all loads . . . automatically. You need not change or compromise your initial settings. These settings are easy to make, with an independent, calibrated dial for each action.

Boiler operators find this Master easy to work with. First, they can transfer to automatic quickly, because they can balance it to existing boiler conditions simply by turning a single, panel-mounted knob. The transfer is "bumpless," there's no boiler upset . . . no operator attention is needed after transfer. Second, operators get instant action from the Master because there are no long control tubing runs. Control circuits are electric all the way from the control room to the "control center" where the Master and the individual Metermax Controllers are located. This, plus electric transmission to the electric drive units, provides instant response. And third, the Master adjusts itself as load decreases, for low-load stability, thus relieving the operators of this additional duty.

Precise control . . . wide-range stability . . . fast response . . . ease of operation. That sums up what you can expect of Metermax Combustion Control.

For more information on this Metermax Master, write to Leeds & Northrup Company, 4938 Stenton Ave., Philadelphia 44, Pa.

LEEDS NORTHRUP
instruments *automatic controls* • *furnaces*

Just one application of "Telvar" controlled weeds around this fence. Note the type of vegetation involved in untreated area in the foreground.

Spray just once with Du Pont TELVAR®

WEED KILLERS

When you use "Telvar" weed killers, vegetation is killed through the roots, and regrowth is prevented because the chemical remains in the soil . . . provides residual action all season long. And low dosages (1 to 1½ lbs. per 1,000 sq. ft.) make it cost little for the results you obtain. Such low rates also mean less handling, less use of storage facilities.

"Telvar" weed killers come as wettable powders, are non-corrosive, non-flammable, non-volatile, low in toxicity to humans and livestock.

Include "Telvar" weed killers in your weed-control program this year. Prove to yourself how these products of Du Pont research can help cut your maintenance cost to new low levels.

Where brush is a problem, Du Pont Ammate® X weed and brush killer is the product you need. It kills more kinds of brush with unusual safety. With ordinary precautions, "Ammate" X may be used close to such crops as cotton, tomatoes, soybeans and peanuts.

• • •

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. Write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, 80 Richmond Street West, Toronto, Canada.

DU PONT
REG. U.S. PAT. OFF.

On all chemicals, follow label instructions and warnings carefully.

WEED and BRUSH KILLERS

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

BOOKS

Bringing Light to the Home

How to Decorate and Light Your Home. By E. W. Commery and C. Eugene Stephenson. Published by Coward-McCann, Inc., 210 Madison Ave., New York, N. Y. 225 pages, illustrated. Price $6.75.

The lighting specialist and the interior decorator team up to present a sparkling new approach to home decorating. Here is a book that any wife would appreciate for it unfolds hundreds of new ideas for interior and exterior lighting and decoration. From a business standpoint, it could be one of the most worthwhile investments a residential sales department could make.

Here are numerous schemes for room settings and lighting adaptable for show window display, model homes, display booths, and other places where electric utilities have a chance to sell the beauty and other benefits of home lighting. But while the handsomely illustrated book does emphasize lighting, it is also a well-rounded book on decoration. It includes discussion of the philosophical background of home decoration, numerous hints on color schemes, and many money-saving ideas.

Published late last year, this book already is well into its second printing. It is the kind of book that has many more printings to go for it will gain popularity as months go by.

Microwave Engineering

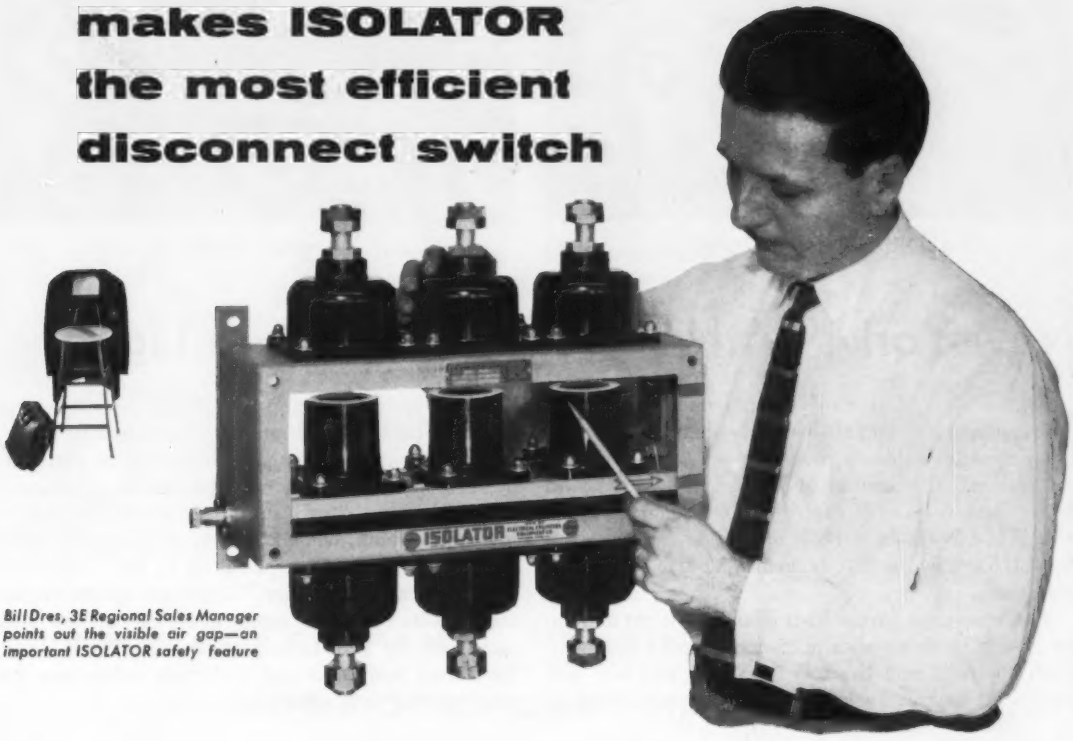
Die physikalischen Grundlagen der Hochfrequenztechnick—3rd Edition. By von H. G. Moeller. Published by Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 275 pages, illustrated. Price DM 29.40.

Written for the dual purpose of surveying the entire field of high-frequency engineering and serving as the introduction for a series on radio engineering, this book is replete with the basic physics and mathematics of electronics. Prior knowledge of physics and mathematics is assumed, but brief recapitulation paves the way to use vector calculus, complex amptitudes, Laplace transforms, and other methods.

This third edition seems completely up to date. It covers transistors and crystal rectifiers as well as the vacuum tubes of microwave. Presentation is largely by solving typical application problems, and extensive diagrams contribute to the clarity. The author has produced a book which can serve as a text for students and a reference for engineers.

Growing use of microwave in the utility field brings new problems for its communication engineers. These men could study this book and broaden their knowledge of high frequency engineering.

Straight line action makes ISOLATOR the most efficient disconnect switch



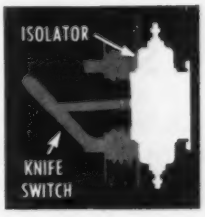
Bill Dres, 3E Regional Sales Manager points out the visible air gap—an important ISOLATOR safety feature

ISOLATORS save on cubicle construction and floor space because they take about ⅓ the space required by equally rated knife switches. They also weigh less and as all elements, including poles, are mounted and aligned on a rigid frame at 3E, they are simple to install.

ISOLATORS are safer ... in the open position, the gap between the bushings is easily visible. Yet the opening is narrow enough to lessen the chance of accidental contact with the live parts. The exposed studs at top and bottom are arranged for easy taping. When your men work in cubicles equipped with ISOLATORS they will be safe from live part hazards.

This switching center, designed and built entirely by 3E, shows how ISOLATORS make a compact, functional and handsome unit. These are, 5 KV, 200 ampere ISOLATORS. The ISOLATOR is also ideal in combination with potheads; any number of arrangements are possible and the units are easily interchanged if necessary. 3E makes many kinds of indoor and outdoor switches, and has a staff of engineers experienced in designing complete units for all types of special applications.

When the ISOLATOR moves from closed to open position its current carrying parts move in a straight line and telescope as contact is made. The parts are enclosed in insulated bushings which also telescope, shielding live parts and eliminating flash barriers.



On your next switching problem, See 3E for recommendations and estimates.
For ISOLATOR data ask for Bulletin 140

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

3E

The Difference—Before . . .

. . . and After . . .

New York's 14th Street Gets Modern Lighting

One of New York City's oldest streets with stores and commercial buildings has been converted into an intensely illuminated thoroughfare by a businessmen's association. The section of 14th St between Union Square and Avenue of the Americas (6th Ave) is the new White Way. It features the use of 22 V-shaped, 8-ft LUXaire fluorescent luminaires mounted on aluminum poles.

The luminaires have a 30-ft mounting height and are on 25-deg elevation with a 25-deg lateral adjustment. Each complete unit has two LUXaires and four 8-ft rapid start lamps. Each lamp has a life expectancy of 7,500 hr and should burn for at least two years under the worst conditions, according to the supplier.

Light intensity for the installation is better than 2 ft-c average. This soft glarefree type light is so abundant that the above "After" illustration was taken at a 0.1 second, stopping vehicular as well as pedestrian traffic.

The installation was sponsored by the "14th Street Businessmen's Association," approved by the Department of Gas and Water Supply of the City of New York, and made by Broadway Maintenance. The LUXaire fluorescent luminaires and aluminum poles were supplied by Pfaff & Kendall of Newark, N. J.

R&IE Standard Stock Plan Permits Prompt Switch Delivery

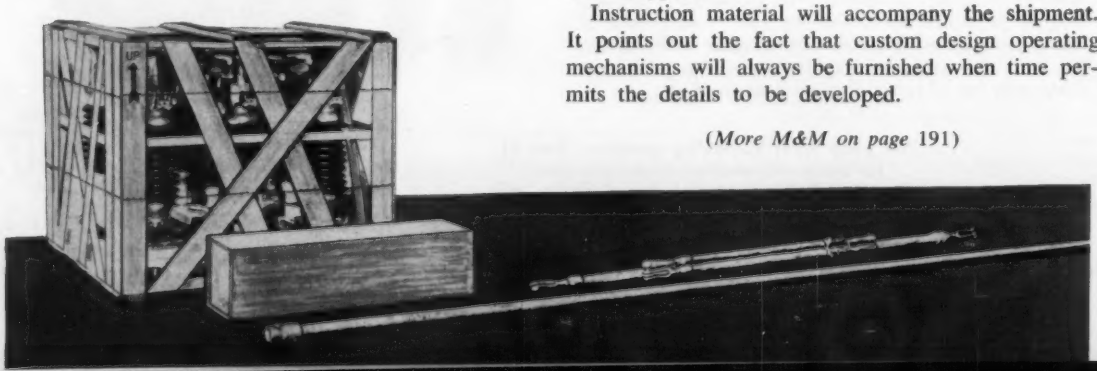
A standard stock plan for switches and operating mechanisms has been adopted by the R&IE Equipment Division, I-T-E Circuit Breaker Co, Greensburg, Pa. This plan permits prompt delivery of air switches, up to and including 34.5 kv, and operating mechanism parts which are supplied in standard lengths for field application.

The illustration shows a typical shipment of a three-pole switch in a new type crate, together with the packaged parts and pipe necessary for operation of the switch.

By furnishing standard lengths of interphase and vertical pipe connections which cover a range of voltage sizes, delivery time is reduced considerably when these parts are fitted at the installation. Instructions are supplied for complete installation of three commonly used types of operation—the direct-torsion type, the direct-torsion reciprocating type, and the offset-torsion type.

Instruction material will accompany the shipment. It points out the fact that custom design operating mechanisms will always be furnished when time permits the details to be developed.

(*More M&M on page* 191)



Photograph Courtesy of Continental Radiant Glass Heating Corp.

WHY GLASS PANEL HEATING

PROMOTES CUSTOMER GOOD WILL

Nothing could be safer—It is a low-temperature heat . . . safe for homes with small children. With adequate wiring, there is no danger of fire with glass panel heat. The high-temper glass is tough . . . resists impact and thermal shock.

Nothing could be cleaner—Painted walls and wallpaper, draperies, furniture and rugs stay cleaner because there is absolutely no soot, fumes or smoke.

Nothing could be quieter—There are no pipes or ducts to crackle or bang as they expand and contract, no hot water to gurgle, no furnace or fan noises. It is positively noiseless.

WHY RA-GRID* HEATER PLATES? *Because they are time-tested!* Blue Ridge has continually made heater plates for over 10 years. Blue Ridge is the only manufacturer who makes the glass, then fabricates it into the complete heater plate.

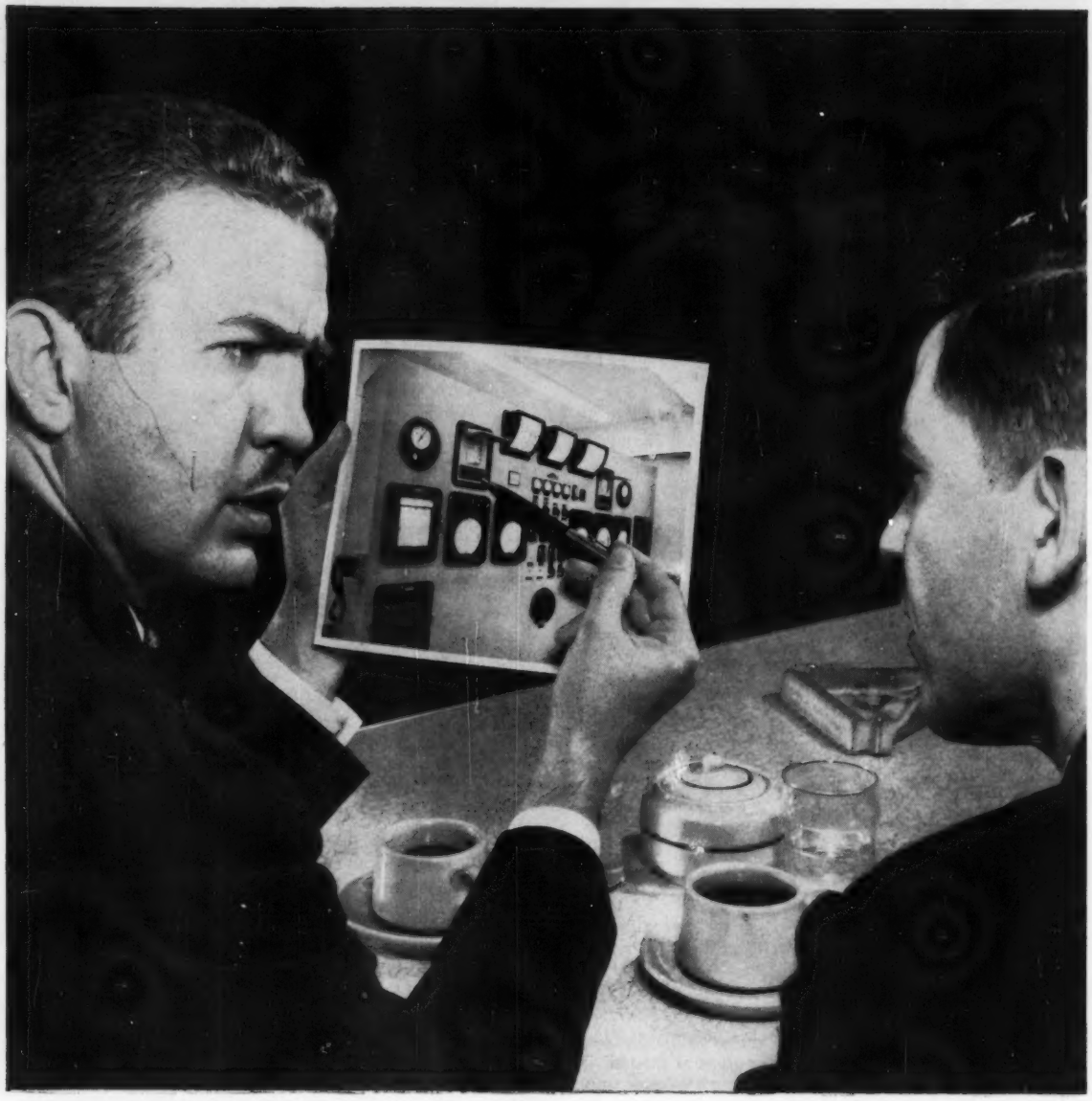
Because they are attractive! The aluminum-backed patterned glass panel blends well with any color plan . . . no matter how often the room decoration changes!

Because they are the safest! Ra-Grid Heater Plates, due to special circuit design, operate at a more uniform temperature over the entire surface, making them more safe and more dependable.

Look for units with the "Ra-Grid" imprint at the lower edge of each glass panel! Write for more information and the names of the manufacturers who use Ra-Grid Heater Plates. *®

MADE BY **BLUE RIDGE GLASS CORP.**
KINGSPORT, TENNESSEE

BLUE RIDGE GLASS CORP. ®



"What, a TV camera looking into the boiler?"

"That's right, Paul. Television cameras are constantly observing the flame conditions in the furnace and the water level in the drum of the power plant boiler."

"Where does the 'picture' come out?"

"At two television receivers on the boiler control panel located in the central control room."

"Where was this again?"

"Down at Southwestern. Southwestern Public Service Company at Denver City, Texas."

"How big is the unit?"

"52,500. They showed me all around: through the 115 KV substation, the power plan building housing the turbo generator and outdoor boiler installation. Real neat job."

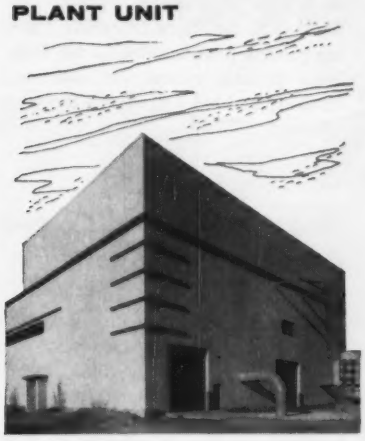
"Who built the plant?"

"A good outfit—Pritchard!"

J. F. PRITCHARD & CO.
4625 Roanoke Parkway, Kansas City 12, Mo.

"What, a TV camera looking into the boiler?"

TEAMWORK BUILT THIS SOUTHWESTERN PLANT UNIT



Teamwork between Pritchard and Southwestern staffs built their new Denver City, Texas power plant unit. Pritchard's ability to work closely with client personnel was the key to successful completion of this power plant project.

Pritchard can do the same job for you!

Why don't you contact Pritchard *first* . . . the next time you make plans to construct, modernize, or expand your power plant.

LIKE TO SEE THE PICTURES?

We'll be glad to send you photographs of this plant unit. They will give you a quick, illustrated tour through the Southwestern installation. Just send your name and address on your company letterhead and we'll send them to you!

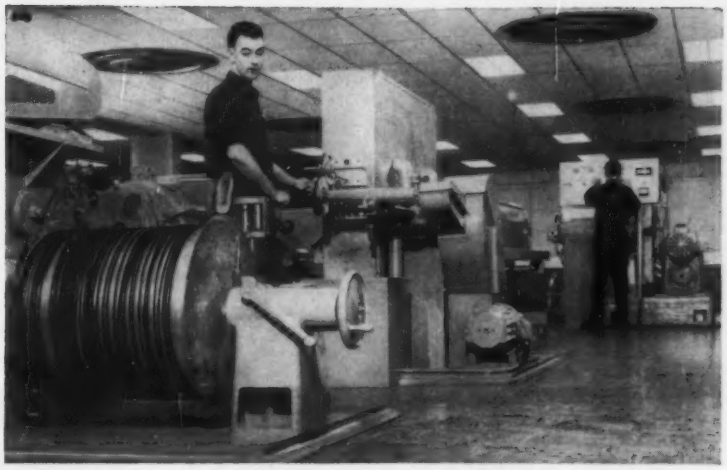
INDUSTRY'S PARTNER FOR PROGRESS

J.F. Pritchard & Co.

ENGINEERS • CONSTRUCTORS

Dept 511, 4625 Roanoke Parkway
Kansas City 12, Mo.

SERVING THE GAS, POWER, PETROLEUM AND CHEMICAL INDUSTRIES
BOSTON, CHICAGO, BUFFALO, HOUSTON, NEW YORK, PITTSBURGH



Hypalon Wire Coverings Researched, as . . .

DuPont Opens Elastomers Laboratory

A product development and technical service laboratory was opened recently by DuPont Co's Elastomers Division. This $2.8-million installation is the latest segment of the company's new technical sales service center at Chestnut Run near Wilmington, Del.

The Elastomers Laboratory is concerned with neoprene, Hypalon synthetic rubber, and related products. It can duplicate, on a pilot-plant scale, many operations in rubber manufacture. One example is the continuous extrusion of Hypalon for electrical wire coverings (illustration).

Some current projects on Hypalon are: Wire coverings suitable for 600-v; developments for higher voltage applications; fabric coatings; white tire sidewalls; and paints.

DuPont is currently building a Hypalon plant at Beaumont, Tex., and a neoprene plant at Montague, Mich.

A-C's New H-V Bushings Feature Interchangeability

Allis-Chalmers Mfg Co announced recently the availability of interchangeable bushings for transformers and circuit breakers rated 115 kv and above. The bushings are made by two different manufacturers and will be supplied on future h-v circuit breakers and transformers.

A-C claims that, by reducing the variety of spare bushings needed, the plan will offer immediate savings to utilities who have had to maintain large stocks of bushings.

The new bushings are available in 800, 1,200 and 1,600-amp ratings. Ratings below 1,200 amp are not normally used on h-v circuit breakers.

The company advises that, in virtually all cases, the new bushings are smaller than existing designs. This enables the new bushing to be adapted to some apparatus now in the field, the company says.

Prior to this development, A-C reports, interchangeability among bushings of various manufacturers had been limited to voltage ratings below 69 kv.

S&C Offers New Finish for Metalclad Enclosures

S&C Electric Co, Cleveland, Ohio, has developed a Super Durabake finish for its metalclad equipment enclosures. The new finish will be available in addition to the long used Durabake.

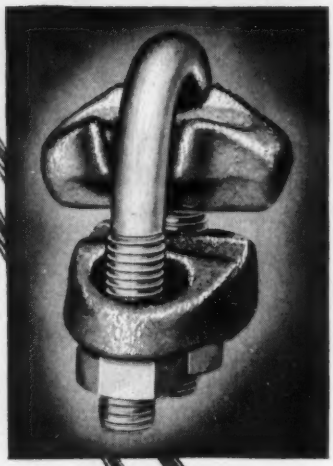
The new Super Durabake finish, according to the manufacturer, is recommended for both outdoor and indoor service where extreme corrosive con-

(*Continued on page* 192)

MIF

malleable iron
high corrosion resistant

GUY CLAMPS



Flexibility. MIF Guy Clamps take a wide range of strand sizes. The two standard sizes cover a total of 8 strand sizes from 3/16" to 1/2".

Easier Installation. Can be placed on strand in seconds. Does not have to be taken apart. Clamp holds strand in place allowing one man with a 10" wrench to complete installation.

Greater Holding Power. Unique tilting or 'come-along' action provides a clamping force that increases as load increases. MIF Guy Clamps are rated from 7,500 to 20,000 pounds.

Lower Cost. MIF Guy Clamps cost less than any other guying device. Require less handling in the field — and a smaller inventory on trucks and in the stock room.

For further information write for Bulletin PH 1.

MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

MIF

Canadian Mfr. & Dist.: LINE & CABLE ACCESSORIES, Ltd. TORONTO

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich.

S&C Offers New Finish

(*Continued from page* 191)

ditions exist. Such locations are near salt water, steel or chemical plants, and regions of high humidity and high temperatures.

Durabake is reported to be a hard, resilient, yet attractive finish which resists scratching, abrasions, checking, and corrosion. It is recommended for normal installations where it will provide adequate protection and require very little maintenance.

Steps in the Super Durabake finishing process parallel those of the Durabake process except for additional spraying and baking, advises the manufacturer.

Anderson Electric Corp— Change from 'Brass Works'

Anderson Electric Corp is the new name of the company formerly known as Anderson Brass Works, Inc, of Birmingham, Ala. R. E. Schuler, president, said that the change went into effect on April 15, 1956.

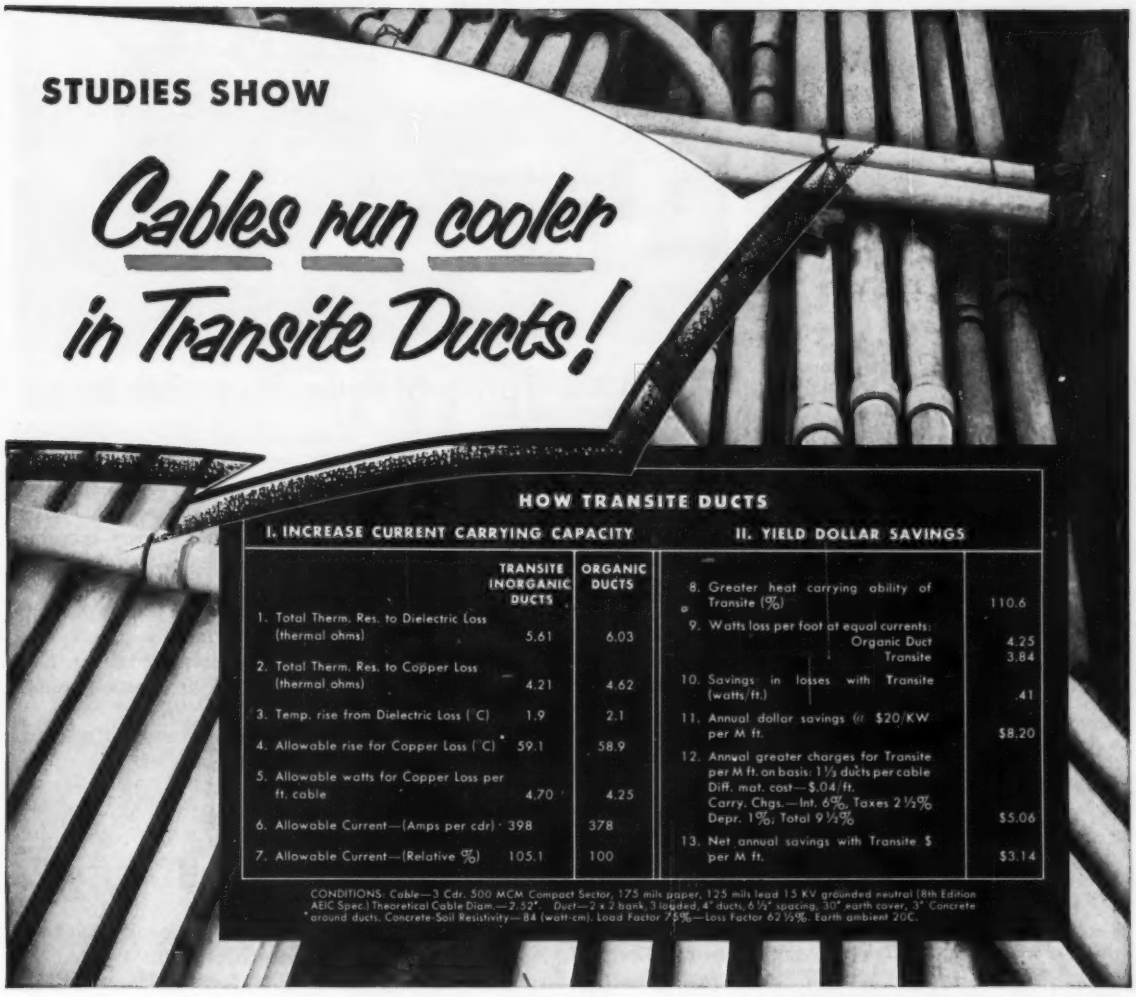
"Our new name," said Schuler, "will more closely identify us with the industry we serve and at the same time will be more descriptive of the product we manufacture. The switch from the major emphasis on bronze to a more aluminum-bronze product lent weight in making our decision."

Cochrane Water System for PSE&G Linden Plant

The water treating system for the new Linden Generating Station of Public Service Electric & Gas Co at Linden, N. J. will include an outstanding demineralizer plant. The system will treat 30 to 100% makeup for boilers of design pressure up to 2,700 lb.

The complete water treatment system is being designed and manufactured by Cochrane Corp of Philadelphia, Pa. It consists of a primary treatment plant to clarify a surface supply followed by a demineralizer to treat 3,200 gpm. Provision will be made for enlargement to 4,800 gpm. Operation of the entire plant is to be fully automatic.

(*More M&M on page* 194)



STUDIES SHOW

Cables run cooler in Transite Ducts!

HOW TRANSITE DUCTS

I. INCREASE CURRENT CARRYING CAPACITY	TRANSITE (INORGANIC DUCTS	ORGANIC DUCTS
1. Total Therm. Res. to Dielectric Loss (thermal ohms)	5.61	6.03
2. Total Therm. Res. to Copper Loss (thermal ohms)	4.21	4.62
3. Temp. rise from Dielectric Loss (°C)	1.9	2.1
4. Allowable rise for Copper Loss (°C)	59.1	58.9
5. Allowable watts for Copper Loss per ft. cable	4.70	4.25
6. Allowable Current—(Amps per cdr)	398	378
7. Allowable Current—(Relative %)	105.1	100

II. YIELD DOLLAR SAVINGS	
8. Greater heat carrying ability of Transite (%)	110.6
9. Watts loss per foot at equal currents: Organic Duct Transite	4.25 3.84
10. Savings in losses with Transite (watts/ft.)	.41
11. Annual dollar savings (@ $20/KW per M ft.	$8.20
12. Annual greater charges for Transite per M ft. on basis: 1½ ducts per cable Diff. mat. cost—$.04/ft. Carry. Chgs.—Int. 6%, Taxes 2½% Depr. 1%; Total 9½%	$5.06
13. Net annual savings with Transite $ per M ft.	$3.14

CONDITIONS: *Cable*—3 Cdr. 500 MCM Compact Sector, 175 mils paper, 125 mils lead 15 KV grounded neutral (8th Edition AEIC Spec.) Theoretical Cable Diam.—2.52". *Duct*—2 x 2 bank, 3 loaded, 4" ducts, 6½" spacing, 30" earth cover, 3" Concrete around ducts. Concrete-Soil Resistivity—84 (watt-cm). Load Factor 75%—Loss Factor 62½%. Earth ambient 20C.

copper losses reduced . . . current capacity increased . . . insulation life prolonged

TESTS have been made for many years by the Johns-Manville Research Center, to determine how Transite Ducts improve the dissipation of heat by conductors under load. The application of the test results is summarized above.

The figures prove that Transite Ducts will carry heavier current loads than organic ducts when sheath temperatures are the same. The result is a cooler cable under a given load . . . lower I^2R losses . . . longer insulation life from lower operating temperatures.

Transite Ducts offer many other advantages, too. Made of asbestos-cement, they are incombustible, resistant to corrosion, unaffected by electrolysis. When arcing occurs, Transite protects adjacent cables from damage. These durable, light-weight ducts provide complete and permanent cable protection, together with savings on installation and maintenance.

For complete details on these tests and the many advantages of Transite Ducts, write for free copy of Brochure EL-29A. Address Johns-Manville, Box 60, New York 16, N. Y. In Canada, 199 Bay Street, Toronto 1, Ontario.

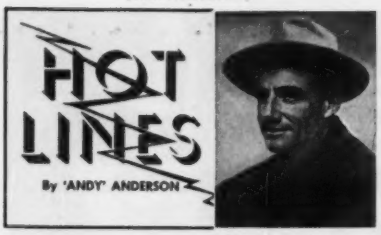
JOHNS-MANVILLE JM PRODUCTS

Johns-Manville TRANSITE DUCTS

TRANSITE KORDUCT—for installation in concrete

TRANSITE CONDUIT—for exposed work and installation underground without a concrete encasement

(Advertisement)



Linemen's Preference . . .

Abbreviations mean different things to different people. "LP," for instance, might stand for "long playing" phonograph records at your house. While to a farmer, "LP" more likely stands for "liquefied petroleum" gas.

Here at A. B. Chance Co., though, "LP" stands for "*Linemen's Preference*," a term we've applied to the hot line tools used most extensively and preferred by most linemen doing hot stick work.

An "LP" list of preferred tools has been compiled by combining the preferences, established in a field survey made throughout the United States and Canada, with the preferences of our own demonstrators who do all kinds of hot stick jobs.

This is valuable information for you men who requisition hot line tools. It will make your decisions a lot easier and the results will be more universally acceptable to your line crews.

The hand tool section of your Chance Catalog is checked to show these preferences, that is, if you have the new sheets. If you don't have these new pages, a post card will get them for you.

Since these pages were printed, however, we've extended the "LP" listings (by popular request) throughout our entire hot stick line. So—to get the complete Linemen's Preference list—return the coupon at the bottom of this column or see your latest copy of "Chance Tips."

Here at Chance, the term "Linemen's Preference" is like a Seal of Approval for hot line tools that have *earned* their rating. The A. B. Chance Co. recommends that you standardize on them in selecting the hot sticks to best serve your linemen.

As many of you know, I'm a "lineman" —not an ad writer . . . which probably accounts for the fact that I've already given you the punch line that should go here. Anyway it will bear repeating, so . . . tear out this coupon and mail it today for the "LP" listing, printed and punched to fit your Chance Catalog.

A. B. CHANCE CO., Dept. 205, CENTRALIA, MO.
Please send me your new list of "Linemen's Preference" Tools.
Name_____
Title_____
Company_____
Address_____
City & State_____
CH56-12

5,500-Kw Turbo-Mobile Plant Exhibited

A mobile, stand-by gas-turbine power plant capable of generating 5,500 kw was developed and manufactured at the Olean, N. Y., plant of Clark Bros Co, one of the Dresser Industries. This turbo-mobile plant was exhibited at the Naval Gun factory in cooperation with the Bureau of Yards and Docks of the Navy during the First ASME Gas Turbine Conference held recently in Washington, D. C.

Some design specifications were:

1. Entire unit had to be contained in one railroad car of such size and design that it could be moved at high speed in any freight or passenger train service without equipment change.
2. Plant had to be ready to operate within 24 hr after its arrival at a site.
3. Operation must be on a wide range of liquid and gaseous fuels, in combination or interchangeably.
4. Only connections were to be a fuel source and the electric transmission line.
5. Water supply was not to be required.

Sidler of Brown Boveri Honored

Paul R. Sidler, president of Brown Boveri Corp of New York, was awarded recently a special citation to commemorate his 12 years of service to the Gas Turbine Division of the American Society of Mechanical Engineers.

The citation read in part:

"The Gas Turbine Power Division of the American Society of Mechanical Engineers honors Paul R. Sidler for his outstanding contributions as a founding member of the Gas Turbine Coordinating Committee (1944) and an able chairman of the Division.

"Beyond this personal recognition, Paul's associates in the Division like to recall his part in introducing the first Brown Boveri gas turbine to the United States some twenty years ago, his services as the Division's first and principal contact for foreign developments, his many papers that made this new prime mover known among engineers, and his constant devotion to the interests of the Division."

Sidler was a member of the Gas Turbine Division's executive committee from 1949 to 1954 and its chairman in 1953.

RWMA Reports Increase in Orders and Shipments

For the third consecutive month through March, new orders obtained by RWMA members exceeded $5.5 million, according to information compiled by the Resistance Welder Manufacturers Association, Philadelphia, Pa. New business for the first three months of 1956, when compared with the same period last year, shows a gain of 116%.

Shipments during the same three months reflect an increase of 24% over the first quarter of 1955. The nearly $4 million in shipments in March represents a record volume.

(*M&M Briefs on page* 196)

Commercial Filters Corporation acquires Honan-Crane and Michiana

Three famous names in filtration now united for greater service to industry...

A FILTER FOR
EVERY PURPOSE
Honan-Crane Oil Filters featuring a wide selection of interchangeable cartridges plus several types of bulk refill materials to provide "selective filtration" . . . exactly suited to your requirements.
Fulflo Filters in all sizes for ultra-high flow rates with lowest pressure drop Low-cost, long-lasting Honeycomb Filter Tubes give true depth filtration in a wide range of precision-controlled densities for any desired degree of micronic filtration
Michiana Lube and Fuel Oil Filters for diesel and gas engine service. Available in a wide selection of types and sizes.

1. **Commercial FULFLO Filters and Honeycomb Filter Tubes** . . . the original controlled density element for full flow liquid filtration.
2. **HONAN-CRANE Filters** with bulk or cartridge filter elements, and **CFC** Pre-Coat Filters, Magnetic Separators, Coolant Clarifiers and Tubular Conveyors.
3. **MICHIANA Lube and Fuel Oil Filters** for diesel and gas engines.

The addition of Honan-Crane and Michiana enables Commercial to offer you the nation's most extensive line of filters for industrial use. Fulflo Filters and Honeycomb Filter Tubes will be manufactured exclusively at Commercial's modern plant in Melrose, Massachusetts. A newly-formed Lebanon, Indiana subsidiary—Indiana Commercial Filters Corporation—will be devoted to the production of Honan-Crane, Michiana and CFC equipment.

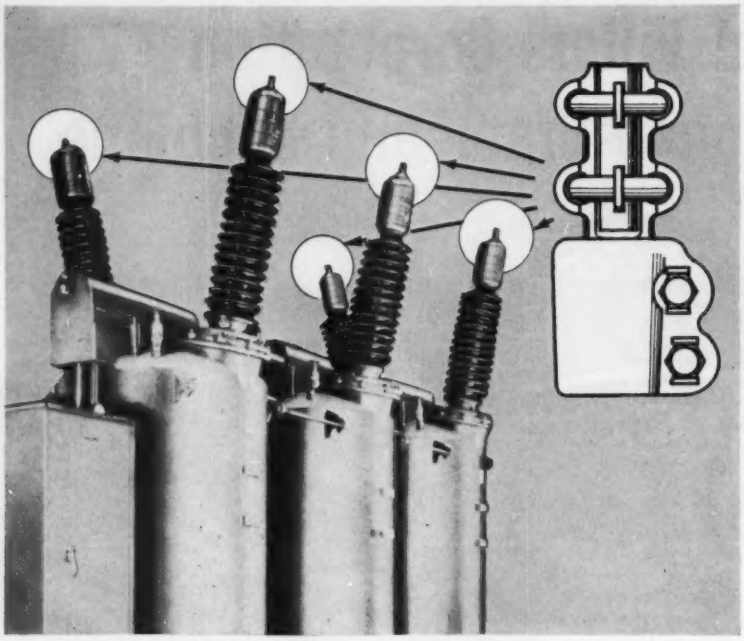
The expanded Commercial Filters organization represents a combined total of 70 years' experience in the industrial filtration field. This wealth of experience is available on any phase of your filtration program.

DISTRICT OFFICES—
New York • Chicago • Memphis

Sales and Service Representatives in more than 30 principal cities

COMMERCIAL FILTERS CORPORATION

plants at:
Melrose, Massachusetts
and Lebanon, Indiana



Will missing stud connectors wreck your schedule?

Too often they're forgotten until a lineman discovers them missing—*on the job*. That can mean days of delay, money lost, and the timing you planned ruined.

Vital links we call them at Royal—like the spark plugs on your car. You want the *finest*, and you want them *on time* . . . with Royal you've got both. Royal stud connectors are high strength copper alloy, designed so that the temperature rise is always less than the conductor. Contact surfaces are finished by grinding, sand blasting and machine brushing to provide multiplicity of point contact. Silicon Bronze bolts are standard—big ½" minimum dia. on conductors 500 MCM or ½" IPS tubing and larger and for studs 1⅛" dia. and larger. Royal is *always* on emergency call to deliver stud connectors to you on the shortest notice possible.

FREE HANDBOOK 24 pages, filled with useful information on stud connector selection . . . only book ever published devoted *exclusively* to subject. Make it part of your reference library. No obligation . . . write TODAY.

ROYAL

A part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRICAL MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

M&M BRIEFS

Ansul Chemical Co, Marinette, Wis., announced recently the approval by Underwriters' Laboratories of three stationary dry chemical fire extinguishing units ranging in size from 500 to 2,000 lb capacity.

Blaw-Knox Co recently marked the fiftieth anniversary of its founding. The firm has grown from the Blaw Collapsible Steel Centering Co, founded in Pittsburgh with $200,000 capitalization, to the present Blaw-Knox with $63-million capitalization.

Ravens-Metal Products, Inc, an aluminum fabricating concern, announced recently that it will locate adjacent to the new Kaiser Aluminum & Chemical Corp aluminum development in Ravenswood, W. Va. The firm will begin operations about mid-May and will specialize in electrical bus bar fabrication.

Udylite Corp of Detroit, Mich., has received an order from Ford Motor Co for an electroplating installation that includes 80 motor-generators with a total capacity of more than 800,000 amp. First machine is to be installed and ready for operation by early 1957. Believed to be the largest of its kind, this installation will handle plating of bumpers at Ford's Monroe (Mich.) plant.

Interlectric Corp, Great Western Division, Warren, Pa., recently began manufacturing a line of incandescent and fluorescent lamps under its own brand name. Great Western has been making lamps for other manufacturers for almost 30 years.

Olin Mathieson Chemical Corp has trained its sights on a new market with introduction of a multi-use, manually powered fastening tool known as Shure-Set. The tool seats a specially constructed fastener into such materials as concrete, concrete block, cinder block, brick and steel.

Stromberg-Carlson has transferred production of Pagemaster, a selective radio paging system, from Los Angeles, Calif., to the Telephone Division in Rochester, N. Y. S-C, a division of General Dynamics Corp, announced that Pagemaster output will be greatly expanded.

MODERN BUSINESS

AND MODERN SCHOOLS

NEED EACH OTHER MORE THAN EVER!

This has been a great year! America is building and replacing and thus moving faster than ever before.

Only one thing. Will the labor market keep pace? That's where schools are important. If your company isn't helping community groups to get modern schools, it's not apt to get the skilled people it needs. Self interest, civic spirit, or both, you should make schools your business, too.

PUBLIC SERVICE • ADVERTISING COUNCIL •

Want to find out how to help in *your* community?
Get specific information by writing:
Better Schools, 9 East 40th Street, New York, N. Y.

Harvey Plank to Head DP&L

Harvey H. Plank has been elected president and general manager by the board of directors of Delaware Power & Light Co to succeed Stuart Cooper, president since 1943 who continues as chairman of the board and of the executive committee.

Plank was formerly vice president and general manager of DP&L. He came to the company in 1943 as assistant to the general manager and was subsequently elected vice president of engineering and operations and then as vice president and general manager. Before his association with DP&L, he was with United Gas Improvement Co for a number of years.

The following appointments were also made: R. B. Richardson, assistant vice president; F. T. Bear, assistant vice president; J. W. Mackie, comptroller, H. J. Perkner, assistant comptroller, and H. M. Barrett, purchasing agent.

HARVEY H. PLANK

Consumers Power Ups Campbell

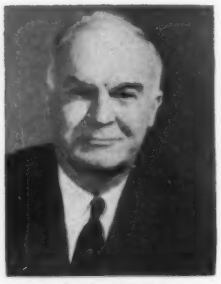
Consumers Power Co has announced the promotion of James H. Campbell from vice president to senior vice president, and the retirement of Justin R. Whiting as chairman of the board of directors.

Campbell, vice president since 1950, came to Consumers in 1933 as power and lighting sales engineer. From 1939 to 1942 he was a power sales engineer for Ohio Edison Co, and in 1946 rejoined Consumers as assistant to a division manager. He became division manager in 1947 and assistant to the president in 1949.

Whiting continues as a director and becomes chairman of the finance and budget control committee and executive organization committee. The board chairman post will be left vacant, the duties being assumed by Pres Dan E. Karn.

JAMES H. CAMPBELL

Westinghouse Elects VP's



F. M. SLOAN

A. M. KENNEDY, JR

Four newly appointed vice presidents for Westinghouse Electric Corp are F. M. Sloan, general manager of the Lamp Division; A. M. Kennedy, Jr, purchases and traffic department manager; W. Waits Smith, manager of the Aviation Gas Turbine Division; and Frank W. Godsey, Jr, manager since 1951 of the Electronics, X-Ray, and Air Arm Divisions. All four will continue to head their present departments.

Sloan, a 24-year Westinghouse veteran, was named Lamp Division manager in 1953. He previously held posts of radar service engineering department manager and operations manager of the Television-Radio Division.

Kennedy joined the company's purchasing department in 1941, and ten years later, after holding purchasing positions in the Small Motor, Meter, and Transformer Divisions, was named director of steel purchases for the company at Pittsburgh.

Smith, who was named to his present position upon joining Westinghouse in 1954, was previously with Studebaker Corp as chief administrative engineer for both gas turbine contracts and the Automotive Division.

An electrical engineering graduate of Rice Institute and Yale University, Godsey joined Westinghouse new products department in 1940 and became department manager in 1945.

W. WAITS SMITH

FRANK W. GODSEY, JR

FOR SPEED!
FOR ACCURACY!

USE BELL SYSTEM PRIVATE LINE TELETYPEWRITER SERVICE

Bell System private line teletypewriter service offers important advantages to those who operate the nation's power lines.

Teletypewriters are used for planning the day's operations, general written communications from load dispatcher to power plants, substations, other dispatchers, and offices.

The service ranges from a simple private line between two teletypewriters up to networks connecting many points. To meet the challenge of today's highly competitive market, you have *direct—fast—accurate—written—private—two-way* record communications.

Let a Bell System communications engineer make a detailed study of your communications. Such a survey may save you time and money. There's no obligation.

• ***Call your Bell Telephone representative***

BELL TELEPHONE SYSTEM

TELEPHONE TELETYPEWRITER TELEMETERING AND REMOTE CONTROL CHANNELS

H. G. Ebdon Advanced to Executive VP

Combustion Engineering, Inc. has announced the promotion of H. G. Ebdon from vice president and general sales manager to executive vice president.

Ebdon has been with the company since 1917, and since 1925 has served in various capacities, including manager of the proposition department, sales engineer, assistant general sales manager, and general sales manager. In 1950 he was elected a vice president.

H. G. EBDON

PERSONAL BRIEFS

Robert I. Coleman, presently manager of Connecticut Light & Power Co's Greenwich district, has been named assistant to **Robert P. Stacy,** administrative vice president. He is succeeded by **Donald S. Valden.** New electric distribution engineer at the company's general headquarters at Berlin is **Stuart C. Heitman,** who is replaced as eastern division engineer by **Francis J. Dwyer,** formerly Meriden district engineer.

Jay Paul Wade will join Central Illinois Public Service Co June 1 as manager of its new public relations department.

Cleveland Electric Illuminating Co's **Willard J. Pugh, Jr,** has been promoted from industrial sales engineer to supervisor in the industrial-commercial unit of the eastern district sales section, area development department.

Recently elected as fellows of the American Institute of Electrical Engineers were **Wallace L. Chadwick,** vice president of engineering and construction, Southern California Edison Co; **Theodore D. Reimers,** inside plant engineer, Consolidated Edison Co of New York, Inc; **Herbert V. Strandberg,** chief engineer, department of lighting, City of Seattle, Wash.; and **Joseph D. Wood,** engineer in charge, high voltage development, I-T-E Circuit Breaker Co.

Fred F. Herman, former manager of ordnance engineering at the Westinghouse Electric Corp plant at Sunnyvale, Calif., has been designated manager of a new plant to be built near Bloomington, Ind. The new plant will manufacture switchgear distribution apparatus . . . **John Knox,** of the Westinghouse traffic staff, Pittsburgh, has been named traffic manager for the company's Electric Appliance Divisions at Mansfield, Columbus, and Newark, Ohio, and Springfield, Mass.

Four major appointments in the engineering section of General Electric Co's Silicone Products Department include promotions of **Dr Stuart D. Brewer** to manager-resin product engineering; **Dr Frederick M. Lewis** to manager-advance development; **Dr Abbott Pozefsky** to manager-analytical and control methods unit; and **Dr William F. Gilliam** to specialist-technical information exchange.

New president of Leach Corp is **Kenneth F. Julin,** executive vice president and general manager since 1954 . . . **Robert S. Coffin,** chairman of the executive committee and former president of Bailey Meter Co, has been elected chairman of the company's board.

Babcock & Wilcox Co has elected **Martin Victor,** previously executive assistant, as secretary of the company . . . **Harold A. Jones,** formerly executive assistant to the national sales manager of Motorola Communications & Electronics, Inc, has been promoted to national sales manager.

Tennessee Valley Authority has designated **Robert M. Gardner** head mechanical engineer to replace **Harold J. Peterson** who resigned. His former position of assistant chief of the mechanical design branch will be filled by **Joseph R. Parrish.**

W. Frank Bort has been appointed manager of industrial construction and **Stanley Kimball** is new manager of heavy construction for Kaiser Engineers Division of the Henry J. Kaiser Co.

Frank P. Doran has been named to the newly established post of plant electrical engineer for Simplex Wire & Cable Co.

Federal Telephone & Radio Co, a division of International Telephone & Telegraph Corp, has appointed **Charles M. Foster** as government sales manager for its Components Division.

Hotpoint Co's commercial equipment department has promoted **Leonard Smith** from sales manager to marketing manager and has named **G. E. Dangler** to succeed Smith.

Appointed plant manager of Highway Trailer Co, a division of the equipment department of Merritt-Chapman & Scott Corp, is **Louis P. Smith,** former manufacturing vice president of Morse Chain Co, a Borg-Warner Corp division.

W. Russell Gorman, a Federal Power Commission attorney since 1937, has been named one of four FPC assistant general counsels, effective May 1.

New manager of Bakelite Co's Extrusion Materials Division is **William J. Canavan.**

OBITUARY

T. H. Bibber, 82, retired sales manager and specialist for Triangle Conduit & Cable Co, died recently. Bibber, whose entire career was spent in the electrical industry, was with Triangle for more than 20 years.

William Henry Harrison, 63, president of International Telephone & Telegraph Corp, and formerly vice president of operations and engineering of American Telephone & Telegraph Co, died recently of a heart ailment. He was a past president of the American Institute of Electrical Engineers.

William A. Thompson, 79, a retired vice president and secretary of Allis-Chalmers Manufacturing Co, died recently after a long illness.

Now Sam knows we prefer PENTA, too . . .

Sam is one of those active front-office guys who like to get out and see what's going on around the district. He came by the other day to see how things were going on the new stretch of line my crew was putting in.

easier to handle

I told him we were getting along fine since we started using poles treated with PENTA*. Sam asked why, so I explained that we like PENTA-treated poles because they're *clean*—easy to handle and install, easy to climb.

Sam smiled a little and said that the front-office people like PENTA-treated poles better because they get fewer complaints from people who happen to brush against them accidentally. He said the attractive appearance of the poles is doing a good public relations job for the company.

Sam pointed out that the company has to consider more than just appearance and easy handling when they buy poles. Long life and price are important, too, and Sam said that PENTA-treated poles fit on both counts. They last and they don't cost any more.

Looks like our company is sold on PENTA. How about yours? THE DOW CHEMICAL COMPANY, Midland, Michigan, Dept. PE 981A.

*Pentachlorophenol

you can depend on DOW CHEMICALS

DOW

→ NOW... test any relay right on the line with a portable MULTI-AMP®

Here's a versatile instrument that takes all the guesswork out of testing your protective and overload relays, current transformers, thermal breakers and related devices. It saves time, too. Only four connections are required with this rugged self-contained Multi-Amp Model 1004, complete with built-in multi-range A.C. meter and timer. Weighs only 35 pounds, including case. It tells you how each piece of protective equipment measures up to the job it is supposed to do!

For testing and calibrating voltage-operated devices, Model 1004-V has all the advantages of Model 1004 plus adjustable voltage output.

A simple maintenance check with the Series 1004 reveals faulty devices immediately . . . prevents equipment damages . . . avoids confusion caused by breakdown emergencies . . . saves "downtime" losses.

Multi-Amp instruments range from compact 0.4 KVA portable models to custom-designed 500 KVA units for testing, calibrating and coordinating all current actuated protective devices. Instruments for special requirements can be developed by our engineering staff.

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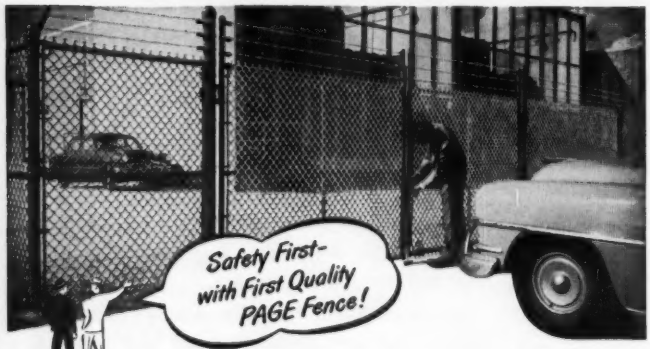
Write today for Data Sheet 1156 on the 1004 series.

TAKE THE "GUESS" OUT OF ELECTRICAL PROTECTION!

PAGE chain link FENCE

America's First Wire Fence—since 1883



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PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

SALES ASSIGNMENTS

COMPANY STAFFS

Allis-Chalmers Manufacturing Co has named Robert P. Reider sales representative at the Peoria, Ill., district office of its Industries Group.

BullDog Electric Products Co has appointed H. L. Barger Philadelphia district manager to succeed Arthur G. Curtin who has been promoted to Midwest regional manager. The company has also named John H. Stewart to its New York district office as a field engineer, and LaRue E. Hollembeak has been assigned to the St. Louis district office.

Electric Controller & Manufacturing Co, division of Square D Co, has designated Howard Scheidle district sales manager of the enlarged Philadelphia territory.

Elliott Co has appointed S. W. Crisman Pittsburgh district manager to succeed the late J. H. Strickler.

Fisher-Pierce Co, Inc, has named H. Walter Lent sales representative in Maryland, Virginia, and the District of Columbia. Lyman Winn will serve in the same capacity in the major portions of Tennessee, Kentucky, Alabama, Mississippi, and Arkansas.

H. M. Harper Co's new eastern district manager is Edward M. Welty, who will supervise all sales operations on the eastern seaboard.

M. W. Kellogg Co, subsidiary of Pullman, Inc, has announced establishment of a western regional office, headquarters in San Francisco, with William R. Dunn, formerly of Elliott Co, as sales manager.

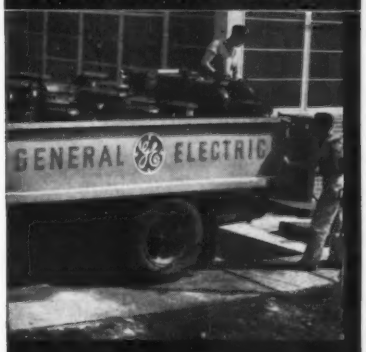
Miller Co's Illuminating Division has appointed the following sales representatives: William J. Byrne, upper New York state; Paul A. Crick, north Texas; William D. Faust, southern Louisiana, Mississippi, and Alabama; Edward D. Heintze, Colorado, Wyoming, north central New Mexico, and the Scott's Bluff area of Nebraska; Robert B. Helfrich, Virginia; Richard J. Slattery, Iowa-Nebraska area; and Richard G. Vacca, Chicago area.

Robertshaw-Fulton Controls Co's Heating Appliance Controls Division has designated K. Kelley Kennan as San Francisco district sales manager to cover northern California, Oregon, Washington, Montana, Wyoming, and Nevada.

Joseph T. Ryerson & Son, Inc, has appointed Howard A. Stai to succeed Loren B. Clay as manager of tubular steel products and cold finished steel bar sales at the Seattle steel service plant.

Thor Power Tool Co has appointed E. C. O'Connell manager of its new Kansas City factory sales and service branch which will serve Kansas and Oklahoma, and parts of Iowa, Missouri, Nebraska, and the Panhandle of Texas.

We take old ones-



make 'em like new

G-E Service Shop

Your local G-E Service Shop makes old distribution transformers new again at about ⅔ the cost of new ones. Our drivers pick up your old or burned-out units. We rebuild them, uprate them, and deliver them to you with a new-transformer warranty. There are 31 G-E Service Shops throughout the country—one near you. 431-18

Progress Is Our Most Important Product

GENERAL ELECTRIC

Fiord Span Longest

(*Continued from page* 100)

Only four cables have been erected, three constituting a 3-phase circuit, and the fourth being a spare conductor. Each of two brackets carry the conductors. There are two smaller brackets fixed at the tower top which may bear two more conductors to make up two 3-phase lines. Lowest point of the cables above sea level is 230 ft.

ACSR Used

The cables are ACSR, having a diameter of 1.095 in. and a cross-section of 0.552 in., 0.482 in. for the steel and 0.0694 for the aluminum. Their breaking load is 60.9 tons. The cables are made of 19 strands, one in the center and the others spread on two layers.

Each cable is rigidly fixed at the Calabrian end and connected to a counterweight on the Sicilian side. As the cables can slide freely on the brackets, mechanical stress is constant in the cable.

The line is now operating at 150 kv corresponding to a delivered capacity of 50 Mw. It was designed for 220 kv with a carrying capacity of 150 Mw.

The need for this connection became apparent as energy demands increased with the growth of the Sicilian population to more than 4 million. Earlier proposals to use submarine cable were abandoned in favor of the present installation because of the cost of such cable and the seisms frequent in the area.

Test Bushings with HVDC

(*Continued from page* 109)

High-voltage dc tests of this bushing showed 50 μ amp leakage, indicating exceptionally low dielectric strength. It failed on surge test at 200 kv. It had also been rejected by capacity measurements. Bushing No. 2 passed two standard tests, but the high voltage dc test showed 20 μ amp leakage. It failed on the fourth surge test at 380 kv.

The two bushings of Group 2 showed leakage currents of 1 μ amp which appears to be in the question-

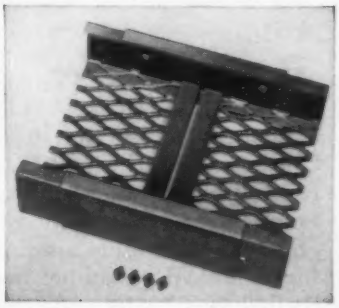
(*Continued on page* 206)

SPECIFY

P-W

for Supporting Cables and Tubing

EXPANDED METAL TROUGH
SOLID METAL TROUGH
LADDER SUPPORTS



P-W provides a strong, versatile and well-grounded system. Channel Connectors with drive rivets are quick and easy to assemble—various lengths and Extension Connectors eliminate field cutting—Adjustable Horizontal and Riser Connectors meet required changes in direction and elevation—supplied in widths from 1" to 24" and lengths from 1' to 16'—Hanger rods or

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P-W assists customers in design and job take-off.

Write today for Bulletins

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Duncan & Melrose Sts.,
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(Representatives to serve you!)

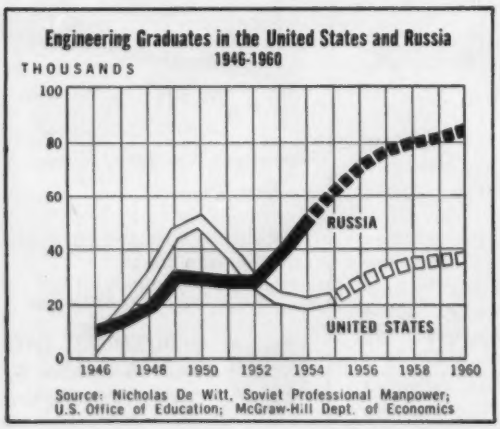
THE SHORTAGE OF SCIENTISTS AND ENGINEERS:

Are We Losing the Race with Russia?

THERE is new confidence in the Kremlin. One key reason is expressed in a recent boast of Communist Party Secretary Khrushchev: **"The capitalists always regard our people as being backward, but today we have more engineers and more supporting engineering technical personnel than any capitalist country."** He promised that this lead would be widened and that communism would be victorious without war.

This boast cannot be dismissed as communist propaganda. Admiral Lewis L. Strauss, chairman of the U. S. Atomic Energy Commission, has warned: **"In five years our lead in the training of scientists and engineers may be wiped out, and in ten years we could be hopelessly outstripped. Unless immediate steps are taken to correct it, a situation, already dangerous, within less than a decade could become disastrous."**

This second editorial in a series on the shortage of scientists and engineers is designed to explore as carefully as possible the facts and the implications of the new emphasis on technical training in the Soviet Union. It draws heavily from the authoritative book *Soviet Professional Manpower*, prepared for the National Academy of Sciences and the National Research Council by Nicholas DeWitt of the Russian Research Center of Harvard and released recently by the National Science Foundation.



Trend Is Against Us

If the Soviet Union already has a lead in technical manpower, it is not very great. Both the United States and Russia now have around a million scientists and engineers. About a third of the Russian engineers were trained on inferior pre-1935 standards. **It's the trend — shown in the chart — that is alarming.**

Over the last five years we have turned out only 142,000 engineers, compared to an estimated 216,000 in Russia. In 1955 our output was around 23,000 compared to their 63,000. Over the next five years our projected output is 153,000, against at least 400,000 in Russia. There will be an additional 150,000 or more in the satellites and Red China.

In Russia, 30% of the college students are in engineering, compared to 8% here. Another 30% or more take degrees in natural sciences. Moreover, unlike ourselves, the Russians are

ploughing back a large proportion of their science graduates into teaching, which implies a rapid buildup in the future.

Quality As Well As Quantity

It would be foolhardy to assume that these new Russian graduates are inferior to ours in the quality of their technical training. They start out with much more intensive mathematical and scientific preparation at the high school level. They study harder and longer in college, with more laboratory work and more practical training. Their courses and textbooks seem to be as thorough as ours. Even though the Russian graduates may be overspecialized, they get results.

These results have been striking. The Russians developed both A-bombs and H-bombs faster than we expected, and it's not certain that they had to rely much on espionage. They pushed ahead of us for a while in jet fighter design, and they showed up with a fleet of long-range bombers well ahead of schedule. They are crowding us on nuclear power, electronics and automation. There are grave fears that they have established a lead in the vital field of military rockets.

The goal of Soviet scientific manpower policy includes not only weapon supremacy but also leadership of the neutral and uncommitted areas of Asia, Africa and the Middle East. The Soviet leaders may be bluffing in their offers to export capital, but they are preparing to export Russian scientific and technical know-how in a big way.

How They Do It

The Russians are determined to win the race for scientific supremacy, and they do not count the cost. **They pay their scientists and engineers salaries that seem fantastic when compared with other Soviet incomes.**

Senior professors, research scientists and top engineers are a major segment of the Russian elite. Their incomes are frequently six to ten times the average industrial wage. (In the U. S. six to ten times the average industrial wage would be $25,000 to $40,000 a year.) Housing and other privileges are correspondingly lavish. While preaching equality, the Soviets use capitalistic incentives far more boldly than we do. Indeed, practicing engineers and scientists have been complaining about the exalted status of professors and top research people, and salary scales are now being adjusted to give greater emphasis to practical results.

The Russians are also generous in their aids to education. Tuition has just been made free at all levels. Undergraduates receive 200 to 500 rubles a month and graduate students 800 rubles (about equal to an industrial wage) to cover living expenses. The biggest stipends go to science and engineering students. College students are deferred from military service, and engineers and scientists often enjoy continued deferment even after graduation.

Finally, the Soviet leaders can channel engineers and scientists — and all other human and material resources — into any area they choose. And the areas the Soviet leaders choose are predominantly those that contribute to military or political objectives, rather than to a better life for consumers.

What's Our Answer?

We are certainly not going to adopt Soviet methods. We do not want scientific robots, but free men, able to understand and add to our democratic heritage. At the same time, our world leadership in technology — and perhaps even our survival as a nation — will be threatened if we allow ourselves to lag far behind Russia in the training of scientists and engineers. Ways to keep the United States in the race will be discussed in a later editorial in this series.

This is one of a series of editorials prepared by the McGraw-Hill Department of Economics to help increase public knowledge and understanding of important nationwide developments of particular concern to the business and professional community served by our industrial and technical publications.

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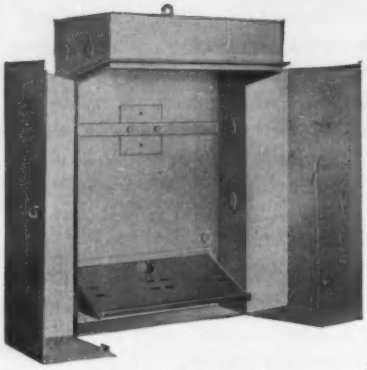
Donald C. McGraw

PRESIDENT

McGRAW-HILL PUBLISHING COMPANY, INC.

KEES Transformer Housing For 4 Transformers



2 CURRENT . . .
2 POTENTIAL . . .

No. 3624-14

- Accommodates high insulation types of GE & Westinghouse transformers, ratio 20 to 1, 2303-volt primary.
- Mounting-bar which supports the two current transformers may be attached vertically or horizontally.
- 16-Gauge zinc-grip sheet steel, welded construction throughout. Doors hinged on both sides, with hold-backs and latch.
- The two potential transformers rest on shelf which slopes to front of housing—gives added clearance, makes installing and replacing easier.
- Knockouts for insulator bushings are spaced to coordinate with current transformers mounted either in vertical or horizontal position.

Manufacturers of Meter Boxes, Pull Fuse Switches, Meter Test Blocks, Portable Handi-Lites

"SINCE 1874"

F. D. KEES MFG. CO.
BEATRICE NEBRASKA

Write P. O. Box 609 for Free Catalog

1. DIGS THE HOLE! 2. LIFTS THE POLE! 3. OPERATION FINISHED!

acker digger makes pole setting as easy as 1.2.3.

The Acker Digger makes short work out of pole setting. *It digs the hole* — up to 22" in diameter. *It lifts the pole* — a built-in cathead winch easily handles loads up to 1250 lbs.

Yet, for all of its rugged, sturdy construction, its compact, lightweight design permits mounting on a small truck. And, it performs equally well on crowded city streets, or isolated open country.

Make us prove that the Acker Digger is best for you. Write for Bulletin 40.

ACKER DRILL CO., Inc.
725 W. Lackawanna Avenue
Scranton, Penna.

Manufacturers of a complete line of Diamond and Shot Core Drills, Drilling Accessories and Equipment

Test Bushing With HVDC

(*Continued from page* 203)

able zone of rejection on the basis of surge test results. One bushing in this group failed on surge test while the other bushing passed. The bushing that failed the surge test had been rejected by the capacity tests. Both bushings were rejected by other tests. These results indicate that with a leakage current of 1 μ amp the bushing should be rejected if capacity tests show cause for rejection.

DC Test Method Verified

The four bushings of Group 3 showed leakage currents between 0 and 0.3 μ amp, indicating very high dielectric strength, 270,000 megohms or more. Three of these bushings were rejected by another standard test method, and the fourth was rejected by a second standard test method. All four bushings passed surge tests and verified the dc test method.

The only weakness of the high-voltage dc test was revealed by physical inspection of bushings 9 and 10. The layer of insulation adjacent to the flange showed zero resistance on both bushings with one standard test method. The second layer measured 25 megohms on one bushing and 5,000 megohms on the other. The other nine layers between the foil on each bushing measured infinity. High-voltage dc tests showed high dielectric strength for these bushings, and they passed the surge tests. Capacity measurements gave the only indication of this condition.

Insulation Tests Must Vary

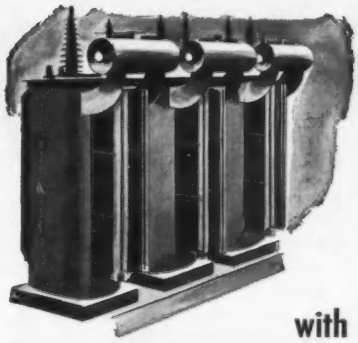
Apparently different types of insulation defects show up with different methods of detection. For example, bushing No. 2 passed power factor and capacity measurement requirements, and its low dielectric strength was uncovered only in high-voltage dc tests.

In addition to tests on the 12 bushings at 90 kv dc, a 40-kv condenser-type bushing which had been rejected by one standard test method was tested at 200 kv dc. It showed only 0.5 μ amp leakage current, indicating insulation strength of 400,000 megohms.

Testing a 40-kv bushing at 200 kv requires a guard circuit to eliminate surface leakage and corona to get an

(*Continued on page* 207)

Seal oil IN! Seal moisture OUT!



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J-M TRANOLSEAL

developed especially for efficient sealing against

refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

Johns-Manville

SEALING COMPOUNDS

Test Bushing With HVDC

(*Continued from page* 206)

accurate measurement of the bushing dielectric.

Results of these high-voltage dc tests indicate that the measurement of leakage current through the bushing dielectric warrants further consideration. The equipment necessary to supply dc at 90 kv consists essentially of a low-cost assembly of commonly used electrical apparatus. Self-protected dc microammeters are now available at low cost.

The use of dc is necessary because:

1. Ac meters reading to the necessary low values of current are not available.
2. With ac it would not be possible to separate capacity current from the in-phase component of leakage current which may have relative ratios of more than 1,000:1.

PNP Postpones Project Pending FPC Hearings

Pacific Northwest Power Co, which hoped to begin building its two Snake River power projects this month, now has set back its schedule to September—because the Federal Power Commission hasn't decided about hearings on the dams.

The four-company power group plans to spend $213 million developing the Mountain Sheep and Pleasant Valley sites on the Snake, but heavy opposition has been encountered from sportsmen's groups, the National Hells Canyon Association and the farmer's unions in the states of Oregon and Montana.

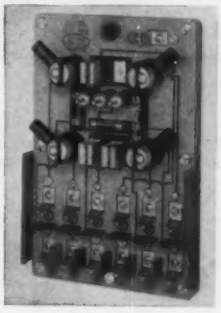
The two dams would produce 1,183,000 kw. But according to Kinsey M. Robinson, president of PNP and Washington Water Power Co, even if the FPC now schedules hearings by May, the September start may not be feasible. With a September start, however, the two dams could generate their first power by late 1959 and would be in full operation sometime in 1960.

Upon completion of the projects, new tax benefits of about $5 million per year, or $250 million in 50 years, will be available to local, state, and federal governments, with 25 counties in four Pacific Northwest states receiving direct tax benefits.

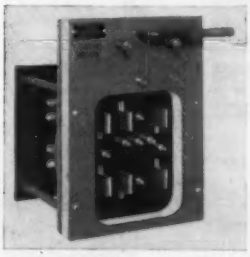
New! THE STATES COMPANY

Polyphase Meter Test Jack

All connections made to terminals at bottom of the jack. No wires cross face of meter. Internal connections printed on front plate of jack. Other forms of jack soon to be on the Market.



200 AMPERE QUICK CONTACTOR



Simply swing lever in one direction to open all blades simultaneously—slide in meter and swing lever in opposite direction to make positive contact. 200 amp. capacity.

INSTALLATION OF 200 AMP. CONTACTOR

INSULATION TESTER

Light in weight, only 6 lbs . . . No probes or leads to handle after attaching to meter terminal and meter case. To impress 1500 volts, push in test switch. Tester circuit so designed that both current and potential are instantly dissipated upon accidental contact. Very handy unit.

THE STATES COMPANY

19 New Park Ave., Hartford, Conn.

I am interested. Please send further information on:

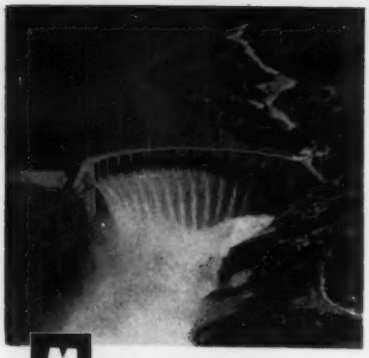
☐ Test Jacks ☐ 200 Ampere Quick Contactor ☐ Insulation Tester

Name..... Title.....

Name of firm.....

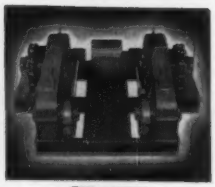
Address .....

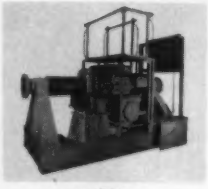
City..... Zone.... State.....



MURCO

POWER DAM GATE HOISTS *for any Size Power Dam*





Murray Gate Hoists are designed and built in a wide range of capacities — from less than one ton to over a hundred tons . . . from the smallest hand operated to the largest motor operated gate hoist.

Back of every MURCO Gate Hoist are over 70 years of designing and building gate hoists.

From this experience we have accumulated designs and patterns that may fit your requirements. In planning power dam gates, we suggest you write us before your plans for the project as a whole are completed . . . it may save expense and important preparation time.

Write for complete information and Engineering Department recommendations.

D. J. MURRAY MANUFACTURING CO.
Manufacturers Since 1883
WAUSAU · WISCONSIN

Power Compromise

. . . seen between U. S. and Canada for settlement of Columbia water rights

Further indications of a friendly compromise between U. S. and Canada on settlement of the thorny question of Columbia River international water rights were seen late last month in statements in British Columbia:

1. British Columbia's Senator Thomas Reid predicted in Vancouver that a decision to construct the $200-million Mica Creek Dam on a tributary of the Columbia 93 mi north of Revelstoke would be reached "within three months."

2. Howard N. Walters, recently-retired general sales manager of BC Electric Co, which has a big finger in the power pie, said Canadian reluctance to enter agreements with U. S. for development of upper Columbia power resources is based on lack of knowledge among Canadians of the river's power potential.

Canadian View Outlined

Outlining the Canadian view of Columbia power development to engineering section of Northwest Electric Light and Power Association in Vancouver, he put it this way:

"The first consideration from which Canadian reluctance stems is a growing appreciation of the needs for power in British Columbia and a desire not to make any contracts which would deprive Canada of its power resources in the future.

"The second consideration is that most people in the U. S. who are concerned with the problem are in the fortunate position of knowing exactly what they are talking about when they discuss Columbia River power as the result of a very extensive engineering study in the U. S. extending back over 20 years. We in Canada have not been in the same position.

"I think that Canadians are not attempting to delay matters unnecessarily and are anxious to get ahead with serious discussion, but naturally enough, they want this discussion to be against a background of competent information about their own resources."

Walters added his conviction to the other Canadian hydro authorities who maintain that the Fraser River or the

(*Continued on page* 211)

INDIANA STEEL & WIRE CO
Crapo Galvanizing
MUNCIE, IND.
Signs along the lines of
Crapo GALVANIZED STEEL STRAND PERFORMANCE
For dependable performance . . . insist upon Crapo Galvanized Steel Strand. Superior tensile strength, combined with long-life, ruggedness and workability, makes Crapo Steel Strand first choice for guys, messenger and overhead ground wire.
The famous Crapo galvanizing process provides dependable protection for the steel, prolongs the expectant life of the strand.
• Low maintenance cost
• Laboratory tested and controlled quality
• Meets highest quality standards
• A size and grade for all practical needs
• Contact your Crapo Jobber Today!
INDIANA
STEEL & WIRE CO., INC.
Muncie, Indiana

MEETING REPORT

Management Problems Studied

PCEA and PCGA groups told wrong attitude toward 'rank and file' workers has led to double pay for some work

Financial, legal, stores and right-of-way problems were taken up at a recent joint meeting of the Administrative Services Section of the Pacific Coast Electrical Association and the Accounting Section of the Pacific Coast Gas Association. About 175 people attended the two-day spring conference at Pasadena, Calif.

Management's attitude toward "rank and file employees as an unresponsive, irresponsible group" is causing U. S. businesses to pay about twice the wages for substantially the same output per employee in 1940. Guy W. Wadsworth, Jr, PCGA president, said non-financial incentives deserve serious consideration as a possible way to alleviate current low output.

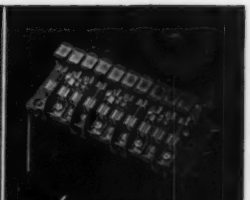
Within the changing (increasing) status of American incomes is where we must look for new private capital, said W. G. Paul, president, Los Angeles Stock Exchange. Need for a better equity-debt ratio comes when industry is expecting to raise more than $35.5 billion annually during the next ten years for new plant and expansion. Industry can provide about 60% new capital, but the rest must come from the man on the street.

William Quinsler, Arizona Public Service Co, said every utility supervisor "owes it to himself and to his company to become generally acquainted with the financial picture of his company and intimately acquainted with the part he plays in shaping this picture."

Harry P. Letton, Jr, Southern California Gas Co, suggested the practice of preventative law as an important function of the legal department. He

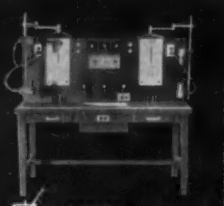
(*Continued on page* 210)

Check with Superior on...

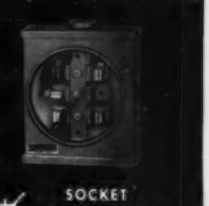


SWITCHES

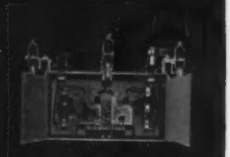
BLOCKS



TABLES



SOCKET EQUIPMENT



ENCLOSURES of all sizes

SUPERIOR SWITCHBOARD & DEVICES CO.
CANTON, OHIO
A subsidiary of
The Union Metal Manufacturing Company

fast way to figure cable terminating needs

UNIT PACKAGE TERMINATING KITS FROM

PLM

UNIT PACKAGE TERMINATING KITS FOR:

ARMORED CABLE

•

RUBBER INSULATED CABLE

● Be sure of the right materials, in the right amounts, in the right places, for every termination to be made in cable runs! PLM Unit Package Terminating Kits simplify planning...eliminate endless details in specifying, ordering and stocking. Each Kit contains detailed instructions and correct materials for terminating one cable of specified rating and type.

ONE order from PLM can take care of ALL your terminating or splicing needs. Ask for catalog or quotations.

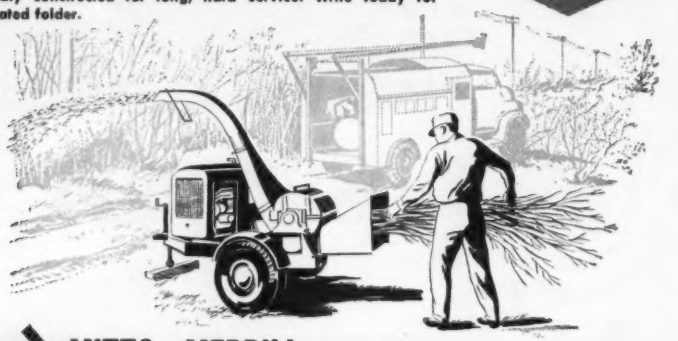
PLM Products, Inc.
3873 West 150th St. • Cleveland 11, Ohio

WIRE AND CABLE FITTINGS AND ACCESSORIES
Armored Cable Terminators • Splicing and Terminating Kits • Conduit Ventilators

M & M BRUSH CHIPPERS

convert 3000 lbs. tree trimmings into small chips in 1 hour

A portable, highly efficient unit with its own power plant, the M & M Brush Chipper converts a truckload of useless brush into a small pile of chips in 21 minutes. The chips make excellent fuel, and can also be used for livestock bedding or mulch. The M & M Brush Grinder will handle branches (green or dry) up to six inches in diameter, and will deposit them in a truck or container or in a neat pile on the ground. The M & M Brush Grinder has a standard trailer hitch for towing behind car, jeep, or truck, and a retractable wheeled jack for levelling when detached from towing vehicle. Moving parts are fully enclosed for safety, and the whole unit is ruggedly constructed for long, hard service. Write today for illustrated folder.



MITTS & MERRILL 1002 South Water Street • SAGINAW, MICHIGAN

94

PREMAX

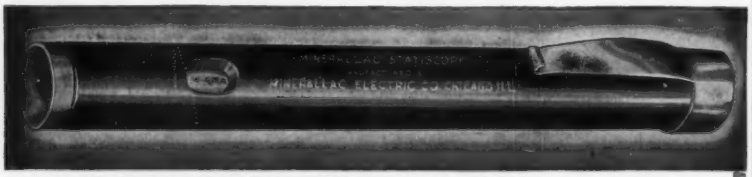
METAL MARKERS

ATTACH IN SECONDS AND LAST FOREVER

Premax letters, figures and special tags insure positive, permanent identification for all utility poles, towers and installations. Made of stamped or embossed brass or aluminum to retain high legibility regardless of weather.

R. E. A. approved. Ask your dealer or write:

PREMAX PRODUCTS Div. CHISHOLM-RYDER Co. Inc. 5649 Highland Ave., Niagara Falls, N. Y.



"VOLT-TELLING STATISCOPE" protects worker

. . . when held in any alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

MINERALLAC ELECTRIC COMPANY

MANUFACTURERS OF STATISCOPES, HANGERS, CLIPS, STRAPS, INSULATING AND CABLE-PULLING COMPOUNDS

25 NORTH PEORIA STREET • CHICAGO 7, ILLINOIS

Management Problems

(*Continued from page* 209)

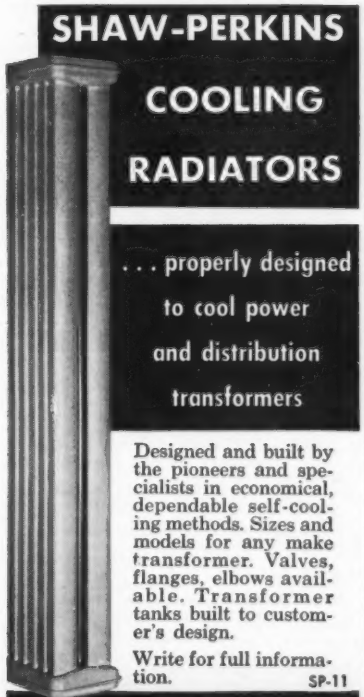
said executives should be kept informed of important developments through "legal bulletins" containing simple, lay-language explanations of recent changes in laws. A second "preventative law" measure could be monthly meetings of the legal staff and department representatives to keep the latter informed on all activities. The legal staff could also meet with sales and operating departments to explain laws that influence their activities.

Use of material and supplies requisitions as source material for punched cards was discussed by George F. Delury, Pacific Gas & Electric Co. Punched cards are applied in many ways to account for items in 13 divisions with an aggregate of 186 substores. Cards based on source material carry type of transaction, material number, quantity, amount, debit or credit, and plant location or item number. They also show numbers for the division, job substore, and requisition, whether material was issued or received, current month and year, and batch or last number. Credit requisitions covering items retired from plant also carry prefix, date of installation, and retirement code. Then the card is useful for stock records, account and job statements, and other accounting and retirement reports.

Stock control through punched cards, said C. O. Dice, Jr, Southern California Gas Co, provides a system which shows minimum level (on hand), ordering point, ordering quantity, and average monthly issues of items. Transaction cards are processed to get a weekly stock status report. The company maintains stocks at an arbitrary safety level of six weeks' supply.

Southwest Streams Low

Southwest shortage of water is expected to continue this summer while Pacific Northwest supply prospects look good, according to U. S. Department of Agriculture forecast. Streamflow from melting snow will decline sharply in south where summer flow of Rio Grande River in New Mexico and Colorado River's tributaries in Arizona may be only one-fourth of normal.


SHAW-PERKINS
COOLING
RADIATORS
. . . properly designed
to cool power
and distribution
transformers
Designed and built by the pioneers and specialists in economical, dependable self-cooling methods. Sizes and models for any make transformer. Valves, flanges, elbows available. Transformer tanks built to customer's design.
Write for full information.
SP-11
MANUFACTURED BY
SHAW-PERKINS
201 EAST CARSON ST. • PITTSBURGH 19, PA.

(*Continued from page* 208)

Columbia and perhaps both will have to be developed within the next 20 years.

And it is becoming generally conceded now that, whatever happens, the giant Mica Dam will have to be built, since it is necessary for either project.

The Mica Dam will impound all the spring floods and create an immense reserve of year-round power for both countries, and more enlightened observers now look toward a compromise being worked out which will not only be fair to U. S., which already has $1.5 billion worth of dams and plants built and $1 billion under construction, but one which also benefits Canada substantially.

Hydro people in B.C. are taking heart from the obvious conclusion that Ottawa and Washington mean business in seeking to settle the Columbia controversy, and that they have decided it can best be settled by diplomacy.

Utilities Slate Budgets for Coming Construction

Recently announced plans for construction, involving budgets that are breaking most previous highs, include the following:

- Consumers Power Co will spend $91 million in 1956 for Outstate Michigan expansion.
- Work begins soon on 105,000 kw, $15-million addition to Indianapolis Power & Light Co's Harding Street Station. It is major part of this year's $57-million budget.
- Expansion costs will total $73,378,000 for South Carolina Electric & Gas Co in next three years. Biggest item is $35-million station, with ultimate capacity of 275,000 kw, near its Saluda hydro project.
- Budget of $7,286,000 is set for 1956 by Sacramento Municipal Utility District.
- Toledo Edison Co plans an $11.4-million expansion this year.
- An $11-million construction outlay is slated for 1956 by Portland General Electric Co.
- Central Illinois Light Co's budget through 1958 totals $42.5 million.
- New generating units for its Ft. Worth and Dallas subsidiaries are major Texas Utiliites Co projects in two-year budget of $135 million.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

STOP

WATER LEAKS

IN FOUNDATIONS TUNNELS DAMS, VAULTS RESERVOIRS AND PITS

with . . .

STONHARD STONTITE

Seals Active Leaks in 5 Minutes

STONITE is fast and easy to apply. No expensive preparation is needed, no skilled labor. It seals almost instantly—even against hydrostatic pressure. Power plants throughout the country use it. Send for details.

STONHARD COMPANY

1306 SPRING GARDEN ST., PHILA. 23, PA.

NAME .....

COMPANY .....

ADDRESS .....

CITY .....ZONE.....STATE.....

EMPLOYMENT OPPORTUNITIES

The Advertisements in this section include all employment opportunities—executive, management, technical, selling, office, skilled, manual, etc.

Positions Vacant
Positions Wanted
Part Time Work

Civil Service Opportunities
Selling Opportunities Wanted
Selling Opportunities Offered

Employment Agencies
Employment Services
Labor Bureaus

DISPLAYED —RATES— **UNDISPLAYED**

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.

Subject to Agency Commission.

$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Positions Wanted ads are ½ of above.

Box Numbers—counts as 1 line.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Not subject to Agency Commission.

Send NEW ADS to Classified Advertising Div. of ELECTRICAL WORLD, 330 W. 42nd St., N. Y. 36, N. Y.

ELECTRICAL ENGINEERS

SENIOR
ASSISTANT AND JUNIOR
COLLEGE GRADUATES

— Electrical Design —
Public Utility Power Plants, Distribution and Transmission Systems

RELAY and APPLICATION ENGINEERS
Min 5 years experience

JUNIOR and SENIOR DESIGN ENGINEERS
2-10 plus years experience

DISTRIBUTION ENGINEER
Min 5 years experience

Location New York—Permanent positions—long established service and supervisory organization for large group of electric Utilities located Latin America. Some travel necessary future. Usual employe benefits. Reply stating age, education, experience, personal particulars and salary expected.

AMERICAN & FOREIGN POWER CO. INC.
and SUBSIDIARIES
2 Rector Street, New York 6, New York
21st Floor DI 4-4400 Ext 8494

ELECTRICAL and MECHANICAL ENGINEERS

OUR ENGINEERING WORK INCLUDES DISTRIBUTION INVESTIGATIONS, SYSTEM PLANNING, TRANSMISSION LINE DESIGN, SUBSTATION DESIGN, GENERAL GAS ENGINEERING AND THE OPERATION OF STEAM ELECTRIC GENERATING PLANTS.

FREE GROUP LIFE AND HOSPITAL INSURANCE, LIBERAL SICK LEAVE PLAN, FIVE DAY WEEK AND A LIBERAL VACATION PLAN ARE BUT A FEW OF THE BENEFITS YOU WILL RECEIVE. ENGINEERING POSITIONS ARE AVAILABLE NOW FOR ENGINEERING GRADUATES WITH LESS THAN FIVE YEARS OF EXPERIENCE. PROMOTION FROM WITHIN MEANS GREATER OPPORTUNITY FOR YOU.

Apply in Person or Write To: R. E. BAETTY

CONSUMERS POWER COMPANY
212 W. Michigan Ave. Jackson, Michigan

STEAM POWER ENGINEER

Steam Power Engineer for large New England utility. Attractive permanent position open for mechanical engineering graduate with broad background of responsible design experience in modern steam power generation who has served as Principal Project Engineer for two or more public utility steam power plant developments of 75,000 KW or greater capacity. Age range 40-50.

P-1511, Electrical World
330 West 42nd Street, New York 36, N. Y.

ADVERTISING MAN WANTED FOR TECHNICAL PRODUCTS

Previous advertising experience not necessary but helpful. Must have at least two or three years of college with courses in engineering and technical subjects and like to write. If you have the qualifications we have an opportunity open for you. Man selected will be trained in all phases of industrial advertising. In your letter of application state age, education, positions held, and give statement of why you want a career in advertising. Location: well-known Connecticut company.

P-1205, Electrical World
330 W. 42 St., New York 36, N. Y.

WANTED

SECTION ENGINEER

$8,000.00 to $15,000.00. Small electrical motors. Age to 55. Supervise: Development, design, manufacture, cost control, customer contact, and application of small fractional and/or electric motors and motor parts to: manufacturers of portable hand tools, for use in portable hand tools and/or aircraft products. Must have a minimum of 5 years experience in electrical motors. A permanent position, it can lead to that of engineering manager, with a leading midwest manufacturer. Send two (2) copies of employment history in resume form. State salary wanted. *Confidential. No obligation.* In reply, refer to position number J-9161. Write to: C. R. Logsdon Company, 19 W. Jackson Blvd., Chicago 4, Illinois.

TAKE-KEEP-TELL-A-FRIEND

FIELD SALES REPRESENTATIVES

Opportunity for E.E. grad. or equivalent; must have successful sales or associated experience to represent an established, but expanding, multi-plant, electrical equipment manufacturer. The Kentucky-West Virginia territory, Oklahoma & Texas Panhandle territory and Maryland, Washington, D. C., Delaware and eastern territory are open. These three territories must be filled by top flight men.

Salary depends on your experience and qualifications. Bonus plan, profit sharing plan, merit increases, expenses and car furnished. Send details, experience, education, age, and etc. to

RW-1657, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

WANTED

SALES ENGINEER

with utility experience and the ability to handle all phases of new business connected with utilities. Age: 25-35. Liberal salary and traveling expenses.

P-1650 Electrical World
520 N. Michigan Ave. Chicago 11, Ill.

$ SALES REPS. WANTED

For Complete Line of Telemetering, Control and Telegraph Terminals

We seek a few experienced sales engineering reps. to serve customers & call on prospects in Northwest, Southwest & South.

RADIO FREQUENCY LABORATORIES, Inc.
BOONTON, NEW JERSEY

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Superintendent—For electric and water utilities in city of 13,000 in heart of Fox River Valley. Electric Utility. New steam turbine generating plant—4000 KW—1—7500 KW—Distribution system 4160/2400Y. Water System, filtration and treatment plant for water taken from Fox River. Present superintendent is retiring. Reply stating age, education, experience, personal particulars, etc. All applications will be held confidential. Reply or stop at Menasha Electric and Water Utilities, 809 Broad street, Menasha, Wisconsin.

Sales Promotion Man, Management Consulting Firm in midwest has an opening for an alert journalism major, 25-30 years old, with some sales promotion or advertising experience in the utility field. Send detailed resume and salary requirements. P-1513, Electrical World.

Man for maintenance of electric utility electronic equipment. Must be familiar with Carrier Current, supervisory, radio, and transmission line relay and control equipment. To work out of the Algodones Plant, Algodones, New Mexico. Travel within a limited area. Furnish qualifications and desired salary in first letter. Apply Plains Electric Generation and Transmission Cooperative, Inc., 915 Copper N. E., Albuquerque, New Mexico.

EMPLOYMENT SERVICES

Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

Salaried Positions $5,000 to $35,000. We offer the original personal employment service (established 46 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 558 Brisbane Bldg., Buffalo, N. Y.

POSITION WANTED

Jr. Distribution Engineer age 33 desires position with public utility. PW-1565, Electrical World.

CLASSIFIED SEARCHLIGHT SECTION ADVERTISING

BUSINESS OPPORTUNITIES — EQUIPMENT - USED or RESALE

UNDISPLAYED RATE:

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

PROPOSALS, $1.50 a line an insertion.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $14.00 per inch for all advertising apearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.

EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

SEND NEW ADVERTISEMENTS TO Classified Advertising Div. of ELECTRICAL WORLD, 330 West 42nd St., N. Y.

WANTED

WATTHOUR METERS

Large Quantities

2 Wire 5 & 10 Amp bottom connected only.

Type OB, OC, CA, 1-16, 1-20, 1-30, JA.

Utilities Write or Call Collect

THE ELECTRICAL WATTHOUR METER CO.

76-15 Woodside Ave. Elmhurst 73, N. Y.

Phone HAvemeyer 9-0131

FOR SALE

SUBJECT TO PRIOR SALE

200 Westinghouse Type CO, Inverse Time Relays, Rated 0.5/2.5 Amperes, 60 Cycle, with Universal Operation Indicator. In Modern Flexitest Cases Which Can Be Mounted Either Flush or Projection. All In First Class Condition. Can Be Used Interchangeably. Styles Nos. 1271197, 1273197, 1545024 and 1545012. If Interested Contact N. C. Stirewalt, V. P., Central Illinois Public Service Company, Springfield, Illinois.

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-4686) will be received at Denver, Colorado, until June 7, 1956, for furnishing one (1) 10,000/12,500-kva, 110-, 69-, and 34.5-grounded wye-kilovolt, 3-phase, class OA/FA, 60-cycle, outdoor autotransformer, having a 2,700/3,375-kva (external load), 12.5 delta-kilovolt tertiary, and with tank-mounted lightning arresters for Guernsey Substation, Missouri River Basin Project, Wyoming. Delivery is desired within 210 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver 2, Colorado. W. A. Dexheimer, Commissioner.

"SEARCHLIGHT"

IS

Opportunity Advertising

—to help you get what you want.
—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

OPPORTUNITIES!

in

New and used equipment recently released from service by a number of electric and gas utility companies

POWER PLANT EQUIPMENT
CONSTRUCTION EQUIPMENT
SUBSTATION EQUIPMENT
TANSMISSION LINE MATERIALS

Send for new list, . . . to

EBASCO SERVICES INCORPORATED
(APPARATUS EXCHANGE)
Two Rector St., New York 6, N. Y.

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—
send your inquiries
We'll also buy your Surplus

Branch Office:
Houston—Walnut 3-4580
FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL WIRE and CABLE Co.

2929 N. Paulina St. Chicago 13, Ill.
EAstgate 7-4777 Code: UNIWIRE

LARGE POWER EQUIPMENT

Prompt Stock Shipment

RENUBILT MOTORS - GENERATORS
TRANSFORMERS - CIRCUIT BREAKERS
DO YOU GET OUR STOCK LIST?

BELYEA COMPANY INC.

51 Howell St. Jersey City, N. J.

TRANSFORMERS

SPECIAL PURCHASE

five carloads
13800 volt transformers
sizes 25 KVA to 250 KVA
new and slightly used

What can you use?
Write for list and prices

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.

5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

FOR SALE

STEAM TURBO-GENERATOR UNITS

Item 1. 600 KW, A.C., 2 phase, 60 cycle 2300 Volts, complete with condensing Unit.

Item 2. 750 KW, A.C., 2 phase, 60 cycle 2300 Volts, complete with condensing Unit.

Item 3. 2000 KW, A.C., 2 phase, 60 cycle 2300 Volts, complete with condensing Unit.

The Patchogue Electric Light Company

448 East Main St. Patchogue, N. Y.

DIESEL ENGINES — POWER MACHINERY

DIESEL GENERATOR SETS—Stationary—Portable—Mobile
MOTORS and GENERATORS—100 KW to 1500 KW

A. G. SCHOONMAKER COMPANY, INC.

Main Office Box 516, Sausalito, Calif. Sausalito 1600
Branch 50 Church St., N. Y. 7, N. Y. Digby 9-4350

MEETINGS CALENDAR

MAY

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, Willis E. Hughes Memorial, Rochester, N. Y., May 17; Orientation Meeting, jointly with AGA, Headquarters, New York, N. Y., May 21.

GREAT LAKES POWER CLUB—Wagon Wheel Hotel, Rockton, Ill., May 17-18.

PENNSYLVANIA ELECTRIC ASSOCIATION—Relay and Electrical Equipment Committees, Hotel Roosevelt, Pittsburgh, May 17-18; Industrial Sales Conference, Galen Hall, Wernersville, Pa., May 17-18; Annual Accounting Conference, Warwick Hotel, Philadelphia, Pa., May 21-22; Systems Operations Committee, Bedford Springs Hotel, Bedford, Pa., May 24-25.

NEW YORK STATE SOCIETY OF PROFESSIONAL ENGINEERS—30th Engineering Industries Exposition with Annual Convention, Statler Hotel, New York City, May 17-19.

INDUSTRIAL HEATING EQUIPMENT ASSOCIATION, INC—Spring Meeting, The Homestead, Hot Springs, Va., May 20-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Business Development and Personnel Section Meeting, Benjamin Franklin Hotel, Seattle, Wash., May 21-23.

AMERICAN MANAGEMENT ASSOCIATION—General Management Conference, Hotel Roosevelt, New York City, May 23-25.

NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS—Annual Meeting, Ambassador Hotel, Atlantic City, N. J., May 24-26.

CIGRE—16th Annual International Conference, Paris, France, May 30-June 9.

JUNE

***ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM**—Steering Committee, Traymore Hotel, Atlantic City, N. J., June 3.

EDISON ELECTRIC INSTITUTE—24th Annual Convention, Traymore Hotel, Atlantic City, June 4-6.

***NATIONAL FIRE PROTECTION ASSOCIATION**—60th Annual Meeting, Statler Hotel, Boston, Mass., June 4-8.

NATIONAL ASSOCIATION OF ELECTRICAL DISTRIBUTORS—48th Annual Convention, Ambassador & Chelsea and Ritz Hotels, Atlantic City, N. J., June 11-14.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Semi-Annual Meeting, Statler Hotel, Cleveland, Ohio, June 17-21.

AMERICAN SOCIETY OF TESTING MATERIALS—59th Annual Meeting & 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N. J., June 17-22.

FIFTH WORLD POWER CONFERENCE—Vienna, Austria, June 17-23.

CANADIAN ELECTRICAL ASSOCIATION—Annual Convention, Manoir Richelieu, Murray Bay, Quebec, June 18-20.

***ELECTRICAL EQUIPMENT REPRESENTATIVES ASSOCIATION**—Summer Meeting, La Playa Hotel, Carmel, Calif., June 20-23.

NORTHWEST ELECTRIC LIGHT & POWER ASSOCIATION—Accounting & Business Practice Section, Multnomah Hotel, Portland, Oregon, June 21-23.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—Accident Prevention Committee Conference, Hotel Roanoke, Roanoke, Va., June 22.

WISCONSIN UTILITIES ASSOCIATION—Accounting Section Convention, Schwartz Hotel, Elkhart Lake, Wis., June 24-26.

MICHIGAN ELECTRIC ASSOCIATION—Annual Convention, Grand Hotel, Mackinac Island, Mich., June 24-27.

ATOMIC INDUSTRIAL FORUM, INC—Conference sponsored jointly with Denver Research Institute, Denver, Colo., June 25-26.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Summer and Pacific General Meetings, San Francisco, California, June 25-29.

AMERICAN SOCIETY FOR ENGINEERING EDUCATION—Annual Meeting, Iowa State College, Ames, Iowa, June 25-29.

AMERICAN CHIEF ENGINEERS' ASSOCIATION—Northwest Power Show, Minneapolis Auditorium, Minneapolis, June 28-July 1.

JULY

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION—Council Meeting, Geneva, Switzerland, July 16-21.

NATIONAL ASSOCIATION OF RAILROAD AND UTILITIES COMMISSIONERS—Annual Convention, Sheraton Palace Hotel, San Francisco, Calif., July 24-27.

COLUMBIA UNIVERSITY INDUSTRIAL & MANAGEMENT ENGINEERING DEPARTMENT—Fifth Annual Utility Management Workshop, Arden House, Harriman, New York, July 29-Aug. 10.

AUGUST

***WESTERN ELECTRONIC SHOW AND CONVENTION**—Pan Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif., Aug. 21-24.

SEPTEMBER

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Accounting Section, Cascadian Hotel, Wenatchee, Wash., Sept. 11-14.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 12-14.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15

EDISON ELECTRIC INSTITUTE—Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 17-19; Meter & Service Committee, Purdue University, Lafayette, Ind., Sept. 24-26.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

ATOMIC INDUSTRIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

***ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM**—Steering Committee, Blackstone Hotel, Chicago, Ill., Sept. 26; Workshop Conference, Blackstone Hotel, Chicago, Ill., Sept. 26-28.

* Additions this week.

Niagara Mohawk Holds Heat Forum

An industrial forum on high-temperature electric heating, conducted recently by Niagara Mohawk Power Corp, brought together representatives of industrial plants in the Buffalo, N. Y., area, reports W. P. Ackendorf, power sales representative, Western Division.

Topics covered by two experts at the weekly meetings included modern trends in electric furnaces and in induction heating, arc furnaces for use in foundries and steel works, 60-cycle induction heating of ferrous metals, continuous tube welding with high frequency resistance heating, heat treating steel with induction equipment, and high power industrial dielectric heating.

William B. Campbell, power sales supervisor in Buffalo, Ackendorf, and Bryon F. Lyth, power sales representative, acted as chairmen during the sessions.

ALL WELDED FEEDWATER HEATERS

ASSURE TROUBLE-FREE PERFORMANCE

✓ *for today's subcritical operation*

✓ *for tomorrow's higher pressures*

INERT GAS SHIELDED TUNGSTEN ARC WELDING OF TUBES TO TUBE SHEETS

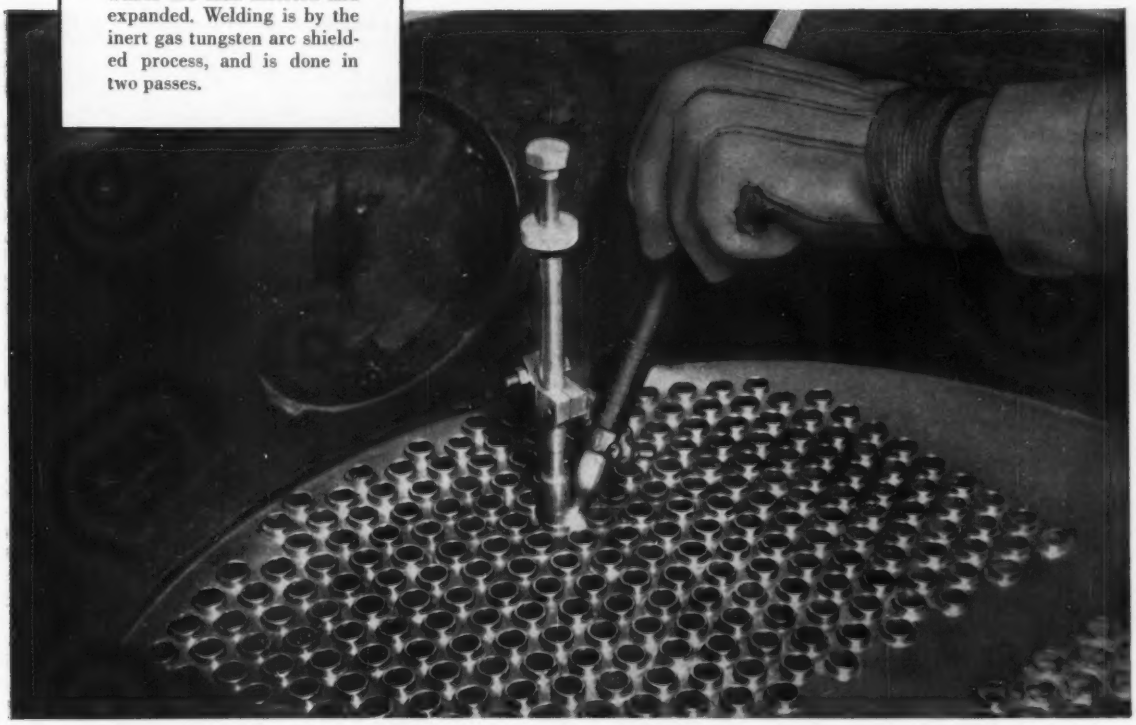
gives leak-proof joints that will withstand severe thermal shocks

The photo below shows the FW method of welding Monel and copper-nickel tubes to the carbon steel tube sheets. In this process, the tube sheet is first clad with Monel. Tubes are then inserted and expanded. Welding is by the inert gas tungsten arc shielded process, and is done in two passes.

FOSTER WHEELER'S new, *all-welded* design, supplementing the standard line of feedwater heaters, eliminates maintenance problems associated with bolted and gasketed joints. There's no danger of leakage under severe thermal shocks, thus permitting quicker start-ups.

The shell-to-adapter joints, tube-to-tubesheet joints and the closure are all *welded*. There are no gaskets, no bolted or rolled pressure joints anywhere in the heater. All of these welds have now been successfully field tested for at least five years on other equipment.

For positive protection against heater gasket leaks and gasket maintenance, it will pay you to look into this new, all-welded design. For further information, write to *Foster Wheeler Corporation, 165 Broadway, New York 6, New York.*



FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

PUAA Awards Copy Winners

Union Electric Co takes six honors of 186 awards given to 99 utilities at association's Philadelphia meeting

Union Electric Co (St. Louis) topped the winners of 35th annual Public Utilities Advertising Association's Better Copy Contest held in Philadelphia last Friday. The company departed with seven award certificates for outstanding 1955 advertising. Cincinnati Gas & Electric Co was second with six awards.

In all, 99 utilities were honored in 21 different classifications. About 2,000 entries from U. S., Canadian, and Hawaiian investor-owned utilities were judged. A total of 186 awards were presented by Warren W. Widenhofer, Indiana & Michigan Electric Co public relations director, who served as the contest chairman.

A special award for "outstanding advertising published in support of private enterprise" in the electric industry went to Stevens County (Wash.) Citizens Power Vote Committee.

Entries in 18 classifications were grouped according to company size: Group A—400,000 or more customers; Group B—150,000 to 400,000 customers; Group C—less than 150,000 customers. Entries for radio, TV, and motion pictures were judged without regard to utility size.

Results In Detail

The winners, excluding purely gas companies and gas utility classifications:

Complete programs—A: Cincinnati G & E Co, first, Wisconsin Electric Power Co, third. B: Wisconsin Public Service Corp, New Orleans Public Service, Inc, Wisconsin P&L Co. C: Washington Water Power Co, first, Hawaiian Electric Co, second.

Series of three to five newspaper ads on a public relations subject—A: Public Service E&G Co, Newark, N. J., Detroit Edison Co, Duquense Light Co. B: Southwestern Public Service Co, Montana Power Co, Wisconsin Public Service Corp. C: Washington Water Power Co, first, Hartford Electric Light Co, third.

Single newspaper ad on any subject—A: Consolidated Edison Co, second, Union Electric Co, third. B: Potomac Edison Co, first, Southwestern Public Service Co, second. C: Hawaiian Electric Co, first, Lowell Electric Light Corp, third.

Employee magazines—A: Detroit Edison Co, second, Union Electric Co, third. B: United Illuminating Co, first, Dayton P&L Co, third. C: Delaware P&L Co, second, Rockland L&P Co, third.

Employee newspapers, two groups—A: Ohio Power Co, Georgia Power Co, Union Electric Co. B: British Columbia Electric Co, Shawinigan W&P Co, Texas P&L Co.

A series of direct mail pieces—A: Boston Edison Co, Cincinnati G&E Co, Duquesne Light Co. B: New Orleans Public Service, Inc, British Columbia Electric Co, New England G&E System. C: Hartford Electric Light Co, first, Washington Water Power Co, third.

Single piece sent to customers—A: Pennsylvania P&L Co, first, Union Electric Co, second. B: New Orleans Public Service, Inc, Arizona Public Service Co, Potomac Edison Co.

Printed material for dealer promotion—A: Philadelphia Electric Co, second, Cincinnati G&E Co, third. B: New Orleans Public Service, Inc, first, Connecticut L&P Co, third.

Special employee literature other than house organs—A: Consumers Power Co, Cleveland Electric Illuminating Co, Union Electric Co. B: West Penn Power Co, Kansas City P&L Co, Shawinigan W&P Co. C: Interstate Power Co, first.

Window displays—A: Southern California Edison Co, Ohio Edison Co, Union Electric Co. B: Kansas City P&L Co, second, Puget Sound P&L Co, third. C: British Columbia Electric Co, Minnesota P&L Co, West Texas Utilities Co.

Interior displays—A: Cincinnati G&E Co, first, Wisconsin Electric Power Co, third. B: Public Service Co of Oklahoma, third. C: British Columbia Electric Co, first.

Car, bus cards and truck posters—A: Pacific G&E Co, Commonwealth Edison Co, Consolidated Edison Co. B: Potomac Edison Co, British Columbia Electric Co, West Penn Power Co.

Outdoor advertising—A: Commonwealth Edison Co, third. B: West Penn Power Co, Dallas P&L Co, Wisconsin Public Service Corp. C: Hartford Electric Light Co, second.

Annual report to stockholders—Pennsylvania P&L Co, Philadelphia Electric Co, Consumers Power Co. B: Shawinigan W&P Co, Dayton P&L Co, Atlantic City Electric Co. C: Northwestern Public Service Co, Iowa Southern Utilities Co, Hawaiian Electric Co.

Radio advertising — Institutional — Division a: Virginia E&P Co. Division b: Arkansas P&L Co. Sales Promotion or direct merchandising—Division a: Mississippi P&L Co. Division b: Cleveland Electric Illuminating Co.

Motion pictures—Philadelphia Electric Co, Washington Water Power Co, Pacific G&E Co.

Television advertising — Institutional — Division a: Duquesne Light Co. Division b: Indiana & Michigan Electric Co, second. Sales promotion or direct merchandising—Division a: Union Electric Co, second. Division b: Philadelphia Electric Co.

Single newspaper ad promoting the use of electricity—A: Houston L&P Co, Georgia Power Co, Cincinnati G&E Co. B: Central Hudson G&E Corp, Southwestern Public Service Co, Portland General Electric Co. C: Hawaiian Electric Co, West Texas Utilities Co, Superior WL&P Co.

Single newspaper ad selling electric merchandise—A: Virginia E&P Co, Duquesne Light Co, Public Service E&G Co, Newark, N. J. B: Indianapolis P&L Co, Wisconsin Public Service Corp, New Orleans Public Service, Inc. C: Pennsylvania Power Co, Northern Berkshire Electric Co, Quincy Electric Co.

'Ham' Moses, Sans Rate Hike, Gets Last Laugh

C. Hamilton Moses, go-getting Arkansas Power & Light Co president, got the last laugh in a recent exchange with Arkansas Gov Orval Faubus, opponent of AP&L's recently rejected rate hike.

Faubus had appeared for a few comments at the community accomplishments contest for which the utility antes up the prize money. He declared that in the business of politics you didn't always win, but communities trying to improve were in a business where "you cannot lose."

Moses, the contest mc, grabbed the microphone: "Governor, I'd just like to say we've been in a business for the last 18 months in which it seems we cannot win." Faubus reportedly blushed then joined in the laughter.

This could be you—"In the Land of No Distributors"

Who needs lamps at a time like this—ahead of eighty-eight missing items that are holding up the job... but it could happen to you if there were no distributors! You'd be forced to place orders direct with hundreds of different manufacturers located all over the country. Barring miracles, deliveries would be disorganized and a tangled mess.

What's more..."In the Land of No Distributors"—

- **You'd be pestered by an army of Manufacturers' Salesman.**
- **There would be no such thing as emergency "over-the-counter" service.**
- **You'd have to carry a tremendous inventory, and insure it.**
- **You'd go "telephone crazy" placing hundreds of calls a day to various suppliers miles away—to say nothing of the expense.**
- **Your Order Department and Accounting Department would have to be increased a hundredfold—and how about credit?**

It's different when you deal through distributors. You tap their inventories for all the equipment and supplies you need. You get it *all*—exactly *when* you need it. He's the *one* source for *everything* electrical—and he's *LOCAL*.

YOUR DISTRIBUTOR IS THE BEST FRIEND YOUR BUSINESS CAN HAVE!

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE®
"IT MUST BE RIGHT!"

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

READERS FORUM

Arizona PS Has Fewer 'Faults' Now

To the Editor:

With reference to "New Distribution Is Oil Company's Answer to Trouble" (EW, April 30, p 68), it was stated that Arizona Public Service Co benefited when Producers Cotton Oil Co installed new switchgear.

To amplify this statement: Before switchgear modernization, permanent faults on the plant's electrical system quite frequently were not cleared by the existing switchgear. When this occurred, Arizona Public Service Co's transformer primary fuses interrupted the short circuit. Producers then would be entirely out of power until a troubleman could refuse the transformer.

Several times, because of a lack of breaker and fuse coordination between Producers' system and Public Service's system, the plant fault neither tripped Producers' breakers, nor blew Public Service's transformer fuses. These faults were cleared by a circuit breaker at the substation supplying the 12-kv distribution feeder. This created a power outage for both Producers and other customers.

Therefore, Producers Cotton Oil Co not only benefited themselves by installing new switchgear but also aided Arizona PS and their industrial neighbors tremendously.

Dick Williams
Industrial Consultant
Arizona Public Service Co
Phoenix, Ariz.

Are You Interested in 'Maxibility'?

To the Editor:

I note, with some concern, editorials in Electrical World on standardizing capability definitions, particularly "Let's Define Capability—II" in the March 26 issue.

For the past few years the major companies in the Southwest Power Pool have had a gentleman's agreement at the operating level that we will maintain a minimum reserve capability of 12% over and above the maximum system demand. Furthermore, to date, our financial people have backed the verbal agreement to the extent that they regularly approve the purchase of any deficit to the tune of $18 kw/yr for power plus energy charges—usually 3 mills/kwhr.

The definition of capability upon which the above agreement is based is "The maximum demonstrated net capability of the unit under the most adverse weather (cooling water temperature) conditions expected." Inasmuch as our annual peak demand regularly occurs during the hot summer periods, we make our capability tests during that time. OG&E tested and revised the stated capability of all its units during the hot summer of 1954.

We know from experience that variations in the capabilities of operators (as well as machines) could make a difference of hundreds of thousands of dollars annually to a company. To us, that is an intracompany responsibility and should not affect intercompany relations so long as either the dollars or the capability is delivered on demand.

I cannot agree on a definition to be used in operation that attempts to restrict fringe advantages such as overpressure, cutting out bleeder heaters, limiting temperatures, limiting auxiliary overloads, or any other routine manufacturers' limits except normal cleanliness. The policing responsibility implied by a detailed definition should be confined to net output.

In conclusion, it will be remembered that formerly, operators' jargon included the word "capacity" until the definitive addicts limited its meaning to nameplate rating. We then discarded it for "capability" which, we hoped, would mean "all that you can get out of it safely," leaving safety judgment to the owner. If we put detailed limitations on the word "capability," let's coin another, such as "maxibility" or something equally absurd, in the hope that semantics won't overtake us before we retire from operating responsibilities.

O. Howard
Manager of Operation
Oklahoma Gas & Electric Co
Oklahoma City, Okla.

Voltage Must Be Constant

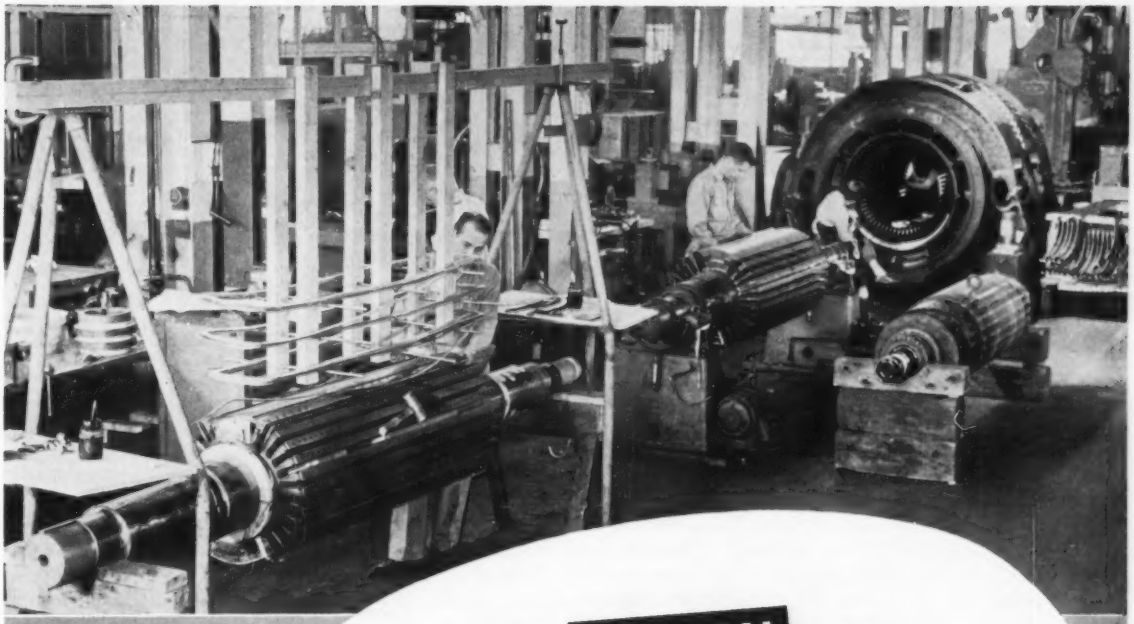
To the Editor:

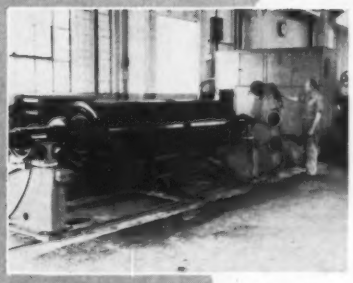
In your fine article on the All-Electric Home, March 19, not much is said regarding the customer's voltage. If all-electric homes are to be satisfactory, the voltage must be right all the time. With the ten fold increase in load in sight none of the older secondary systems is going to be satisfactory.

As a discussion point, I would suggest secondaries at 4,000/2,300 v with underground services to each home and a packaged transformer metering unit sited on the ground outside the house.

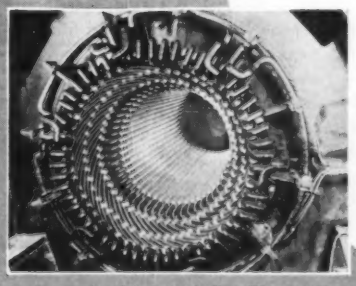
It will be no use trying to popularize the all-electric home if the customers voltage is allowed to swing plus or minus 8% during the day as frequently happens.

J. P. Thornton
943 Wilmer Street
Victoria, B. C.
Canada





A rotor being dynamically balanced to close tolerances after rewinding to insure vibration-free operation.



A completed stator winding (Note special end turn tying and bracing).

CALL NATIONAL FOR FAST SERVICE AND TOP QUALITY ON REWINDING INDUSTRIAL TURBO GENERATORS

Fast service. Top quality for longer service life. Modernization for improved performance. You can count on these when you call on National for rewinding of your turbo generators.

The National shops are completely equipped and manned for the performance of all winding operations. When size or distance makes it impractical to ship the machine to us, we do the work on the spot. For complete details, just call your nearby National field engineer or drop us a line.

NATIONAL ELECTRIC COIL COMPANY

COLUMBUS 16, OHIO, U. S. A.

TRADE MARK

ELECTRICAL ENGINEERS: MAKERS OF ELECTRICAL COILS AND INSULATION—
REDESIGNING AND REPAIRING OF ROTATING ELECTRICAL MACHINES

ICC Advocates 'Fair Value' on Car Rentals

- Commission argues depreciation should be based on present value of assets and so should the rate of return
- Commission says some consideration should be given to incentive and risk when determining a fair charge on cars

A decision of considerable interest to electric utilities was delivered recently by the Interstate Commerce Commission when it recognized "fair value" in car rental determination. While the instant proceedings were not a matter of rates charged to the public but rather an adjudication of the reasonableness of inter-carrier use of freight cars, nevertheless, the language of the ICC's opinion is significant.

Car Rental Rate Upped

In 1949 the ICC findings were that a $1.50 rental per day for a car was not unreasonable. However, under procedures permitted to the Association of American Railroads the rate was increased to $2.40. This rate was contested by two carriers and while the ICC was not asked to prescribe the exact level of rates it did state that the current compensation of $2.40 per day was not unreasonable.

In substance, the ICC argument was that in setting rates depreciation should be based on the present value of assets and that the fair return should likewise be based on the current value of freight cars.

Depreciation Discussed

With regard to depreciation, the commission's opinion stated that "we realize that in determining depreciation the prevailing accounting practice is to use the ledger value, and we are not here concerned with the propriety of that practice. Our problem here is to determine the justness and reasonableness of the per diem rates in effect during the respective periods referred to and at present.

"In reaching such a determination we would be less than realistic if we failed to take into consideration, as pointed out in the 1949 report, that carriers who now buy cars must pay prices predicated on present values, and those who rent cars owned by others should expect to pay rentals based on such values. Failure to do so would cast an undue burden upon the car owners and favor unduly those who pay rentals.

The ICC continued that "for the foregoing reasons . . . the basis should be the undepreciated reproduction value."

As to the rate of return, the ICC noted that "argument over investment base and percentage rate of return should not obscure the practical point involved, which is the number of dollars available by way of rental to a carrier which makes an investment in freight cars for joint use in nationwide transportation service. It seems clear that the car-owning carrier is entitled to a return larger than one based solely on cost of money measured by current interest rates, for in acquiring cars it acts somewhat as a entrepreneur.

Incentive Risk Considered

"It must assume the burden of planning and financing the new equipment in the light of an uncertain demand for cars in general or those of a particular size and type due to unpredictable factors affecting the outlook for rail transportation. In other words, in determining a fair per diem charge some consideration should be given to what are termed incentive and risk, and an appropriate place for such an element is in the capital charge.

"In our 1949 report we stated that an interest charge of 6% of present value of freight cars did not appear to be excessive. We adhere to that view on the instant record."

The foregoing opinion is of material interest to all utilities in two particular respects. The first analogous situation is the purchase of power by one utility from another utility. In original cost jurisdictions such power costs would benefit the purchaser by relieving him of the need to construct his own plant at current prices. Such prices would be much higher than the original cost of plant of the utility selling the power. In addition to the foregoing benefit the purchaser would be able to obtain a tax deduction for all of the purchased power, something he would not be able to do if such power were generated in his own plant.

The second situation is the sale of large amounts of power by a utility to industrial customers whose own power cost, if they generated themselves, would of necessity be based on current costs of plant. In addition, such a customer would be tying up money in an investment which could earn a far higher return if employed in the customers own industrial operations. The benefits of tax deductibility would also be operative in this instance.

Finally, it should be noted that even the ICC, long a stronghold of the original cost doctrine, has come to realize that the economic facts of life cannot be reconciled with mere bookkeeping procedures based on original cost.

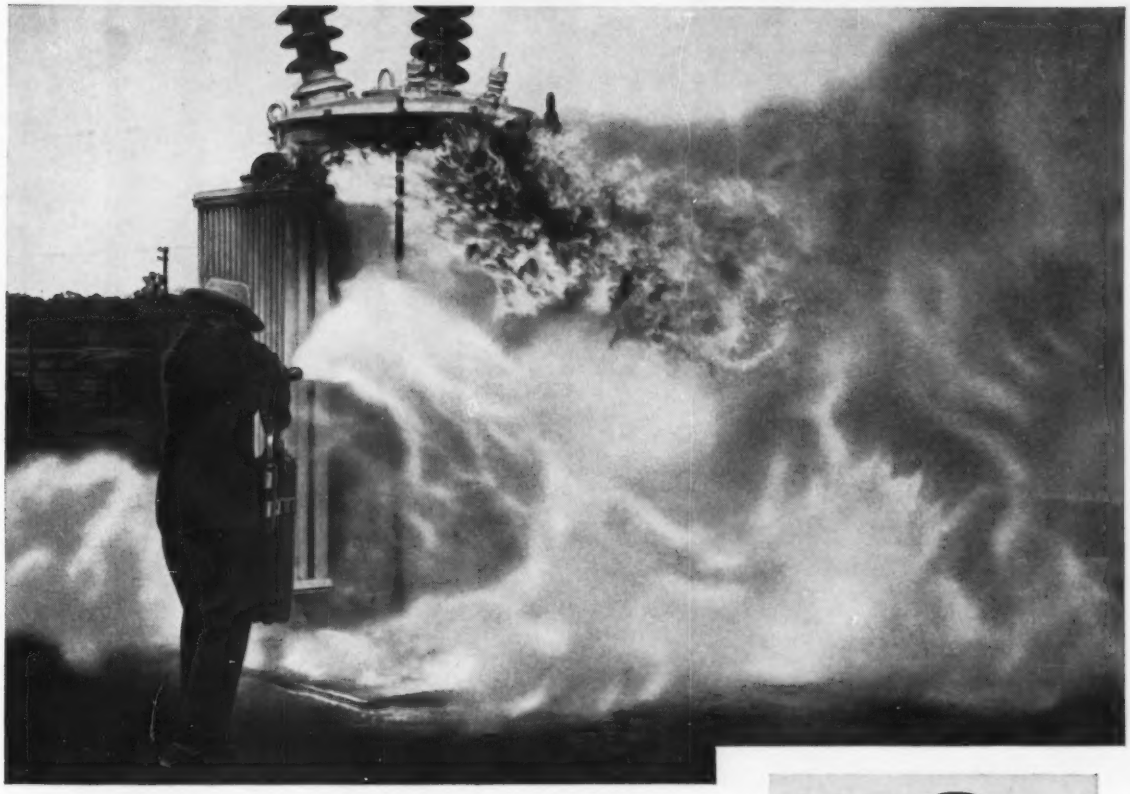
Seattle Light Plans $500,000 Rate Reduction

Two groups of City Light customers at Seattle will receive rate reductions totaling $500,000 annually under a new rate schedule proposed by Superintendent Paul Raver to the City Council and scheduled to go into effect May 31, following expected approval by the Council.

Approximately 1,500 commercial customers using more than 3,000 kwhr per month will receive $300,000

(*Continued on page* 222)

TRANSFORMER FIRE!



KIDDE DRY CHEMICAL SNUFFS IT FAST!

Ready, aim . . . and the most stubborn fire's out . . . stopped in its tracks by the *extra* fire-killing power of Kidde Dry Chemical Extinguishers!

Light in weight (to let you move fast and aim quickly), these exceptional dry chemical extinguishers feature Kidde's patented diffuser horn which gives you up to *44% more* fire-fighting coverage than ordinary dry chemical extinguishers. This feature, plus Kidde's fast-acting trigger-finger grip, lets even inexperienced operators fight severe fires calmly, quickly and without danger.

In addition, the Kidde dry chemical line offers you variety of models and capacities. Cartridge-operated Kidde dry chemical extinguishers come in 20 and 30-pound capacities, while the pressurized dry chemical models are available in capacities of 5 and 10 pounds. All Kidde pressurized extinguishers have easy-to-read, dustproof pressure gauges, can be charged to U.L.-approved working pressures (150 pounds) at any commercial air pump. In addition, the 10-pound model can be charged to 250 pounds for extra fire-fighting punch! It is U.L.-approved at either pressure.

For more information on the complete Kidde Dry Chemical line, write today for Kidde's P-8 Extinguisher Catalog.

Kidde 20-pound dry chemical portable

Kidde

Walter Kidde & Company, Inc.
530 Main Street, Belleville 9, N. J.
Walter Kidde & Company of Canada, Ltd.
Montreal—Toronto

Seattle Light Rates

(*Continued from page* 220)

of the annual savings, while 135,000 residential customers on the all-electric rate will save $200,000 annually.

All-electric residential customers now paying $5 for 480 kwhr will receive 500 kwhr for the same amount. They also will be permitted to have 50% higher wattage in the upper elements of their water-heating tanks, speeding up the heating.

"Under the new schedule, an all-electric customer will be able to add an electric blanket, a waste disposal unit, an electric mixer, and a heat lamp and still pay the same bill he is now paying," explained Councilman Bob Jones, chairman of the city utilities committee.

Commercial customers using more than 3,000 kwhr per month on a single meter will save up to 8%, under the new schedule, while combining of their service on a single meter will mean an additional saving, said Jones. These consumers, comprising about 7% of the total number of commercial customers, include office buildings, hotels and stores. Under the new schedule, they will pay from 1.3¢ to as low as 0.6¢ per kwhr, as compared with 1¼¢ to 0.8¢ under the present schedule.

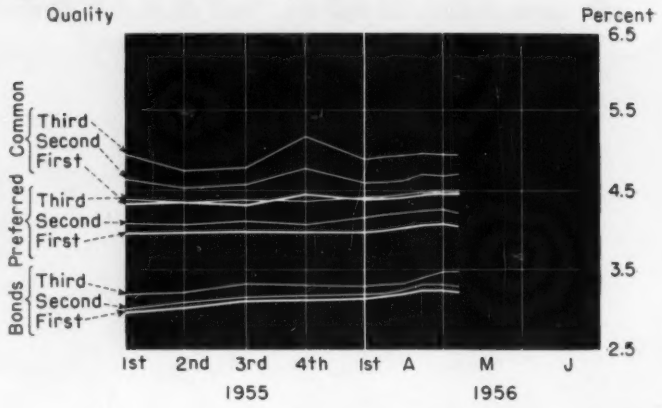
Raver pointed out that this will be the third rate reduction since City Light took over Puget Sound Power & Light Co properties in the Seattle area five years ago.

FINANCIAL BRIEFS

Arkansas-Missouri Power Co is planning to pay a 5% stock dividend on June 15 . . . **New England Electric System** stockholders have subscribed for 776,054 common shares of 834,976 offered on a 1-for-12 basis at $16 a share. Employees subscribed for 56,148 shares leaving 2,774 shares to be purchased by the underwriting group.

Higher Common Dividends—Florida Public Utilities Co will pay July 2 a quarterly common stock dividend of 16¼¢ a share as against 15¢ a share in the previous quarter . . . Iowa Electric Light & Power Co will pay July 2 a quarterly common stock dividend of 37½¢ a share as compared with 32½¢ a share in previous quarter.

Today's Utility Yields (%)

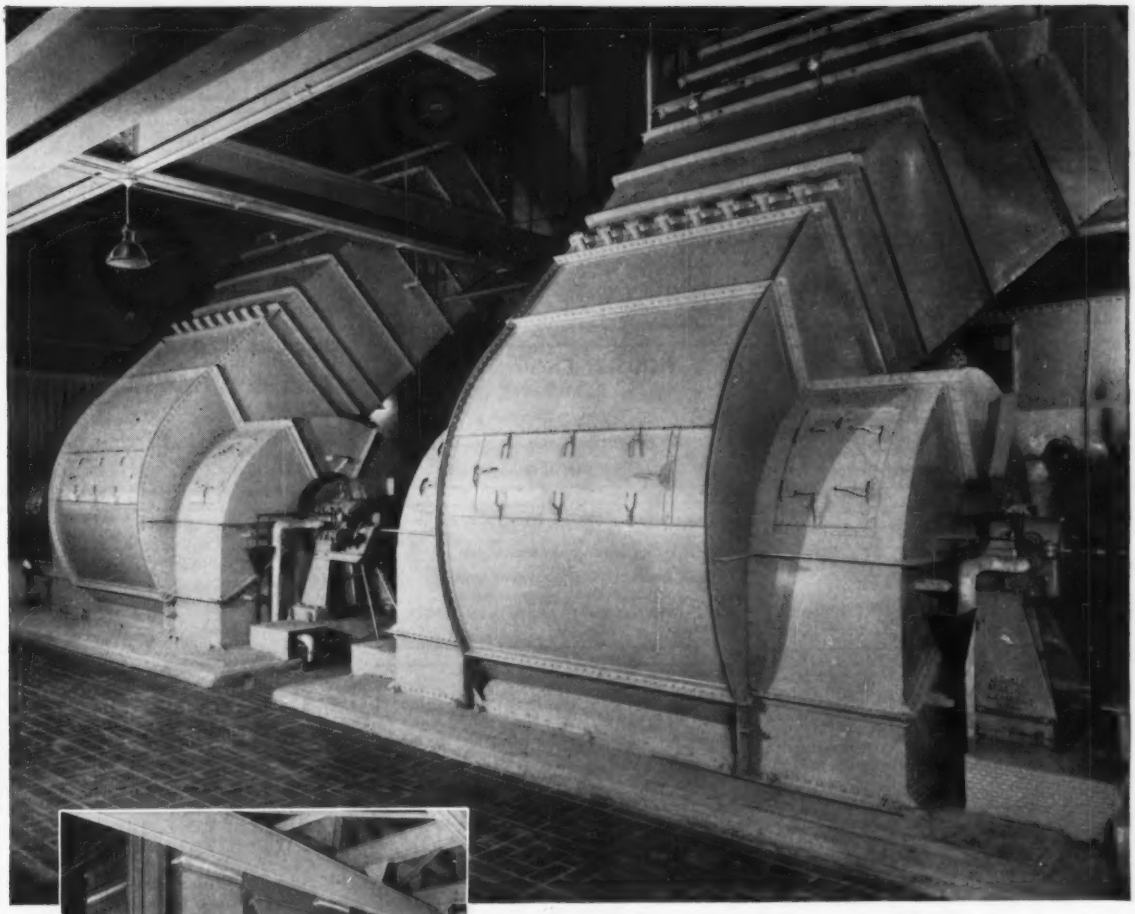


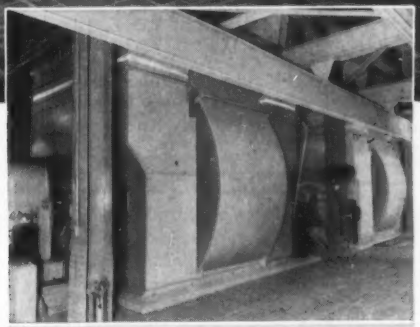
QUALITY	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
May 3	3.22	3.29	3.48	4.08	4.25	4.50	4.48	4.71	4.98
April 26	3.25	3.31	3.48	4.09	4.28	4.50	4.48	4.68	4.96
April 19	3.25	3.31	3.43	4.07	4.25	4.49	4.46	4.70	4.97

Utility Earnings

COMPANY	PERIOD MONTHS ENDED		NET INCOME 1955	NET INCOME 1954	EARNINGS PER COMMON SHARE 1955	EARNINGS PER COMMON SHARE 1954
Arkansas-Missouri Power	12	Dec.	$1,064,672	$969,449	$2.06(a)	$1.76(a)
California Oregon Power	12	Dec.	3,817,026	3,416,362	2.11	1.86
Central Maine Power	12	Dec.	6,798,141	5,950,454	1.79	1.56
Citizens Utilities	12	Dec.	1,025,062	985,887	1.07	1.02
Community Public Service	12	Dec.	1,475,607	1,385,892	1.79	1.69
Delaware Power & Light	12	Dec.	5,113,714	4,663,311	2.32	2.08
Empire District Electric	12	Dec.	1,687,044	1,482,264	2.17	1.96
Hilo Electric Light Co	12	Dec.	322,909	272,462	2.15	2.18
Housatonic Public Service	12	Dec.	538,229	586,530	1.41	1.58
Indianapolis Power & Light	12	Dec.	7,018,920	5,781,447	1.88(b)	1.62(b)
Iowa Electric Light & Power	12	Dec.	3,774,114	3,235,232	2.05	1.77
Iowa Southern Utilities	12	Dec.	1,394,938	1,201,558	1.70	1.44
Lake Superior District Power	12	Dec.	1,087,671	1,022,773	1.53	1.43
Michigan Gas & Electric	12	Dec.	616,500	524,500	3.66(c)	3.04(c)
New York State Electric & Gas	12	Dec.	10,631,041	9,382,952	2.71(f)	2.35(f)
Northern States Power and subsidiaries	12	Dec.	18,692,000	17,230,000	1.16(g)	1.07(g)
Northwestern Public Service	12	Dec.	930,421	855,029	....	....
Pacific Power & Light	12	Dec.	8,997,000(o)	8,080,000(o)	2.45(o)	2.19(o)
Pennsylvania Power & Light and subsidiary	12	Dec.	21,435,666	22,137,527	3.02(h)	2.88(h)
Potomac Electric Power	12	Dec.	8,457,369	6,438,358	1.43	1.17
Portland General Electric	12	Dec.	5,021,980	4,346,351	1.67	1.45
Public Service Co of Colorado	12	Dec.	9,640,348	7,823,518	2.69	2.31
Rochester Gas & Electric	12	Dec.	5,810,743	5,466,411	2.97(i)	2.78(i)
Shawinigan Water & Power, consolidated	12	Dec.	9,451,984	7,413,784	3.48(j)	2.91(j)
South Carolina Electric & Gas, consolidated	12	Dec.	5,146,699	4,727,195	1.35(k)	1.33(k)
Tampa Electric	12	Dec.	3,410,990	2,977,025	1.37(l)	1.37(l)
Western Light & Telephone	12	Dec.	1,601,614	1,260,964	2.70(m)	2.42(m)
Union Electric Co	12	Dec.	19,763,200	19,278,644	1.75	1.70
Utah Power & Light	12	Dec.	6,887,183	5,878,521	3.10(n)	2.88(n)
Virginia Electric & Power	12	Dec.	19,052,000	16,786,000	2.54	2.20

Notes—All the figures shown above have been audited; (a) Based on 496,579 shares in 1955 and 460,839 shares in 1954; (b) Based on 3,354,964 shares in 1955 and 3,145,278 shares in 1954; (c) Based on 148,568 shares; (f) Based on 3,337,475 shares in 1955 and 3,034,068 shares in 1954; (g) Based on 13,418,408 shares; (h) Based on 5,916,824 shares in 1955 and 5,659,095 shares in 1954; (i) Based on 1,517,000 shares; (j) Based on 2,422,164 shares in 1955 and 2,195,945 shares in 1954, (k) Based on 3,360,848 shares in 1955 and 3,150,795 shares in 1954; (l) Based on 2,172,855 shares in 1955 and 1,975,323 shares in 1954; (m) Based on 485,939 shares in 1955 and 394,091 shares in 1954; (n) Based on 2,220,000 shares in 1955 and 2,042,500 shares in 1955, and (o) Before provision for deferred income taxes resulting from accelerated amortization of the Yale project.





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